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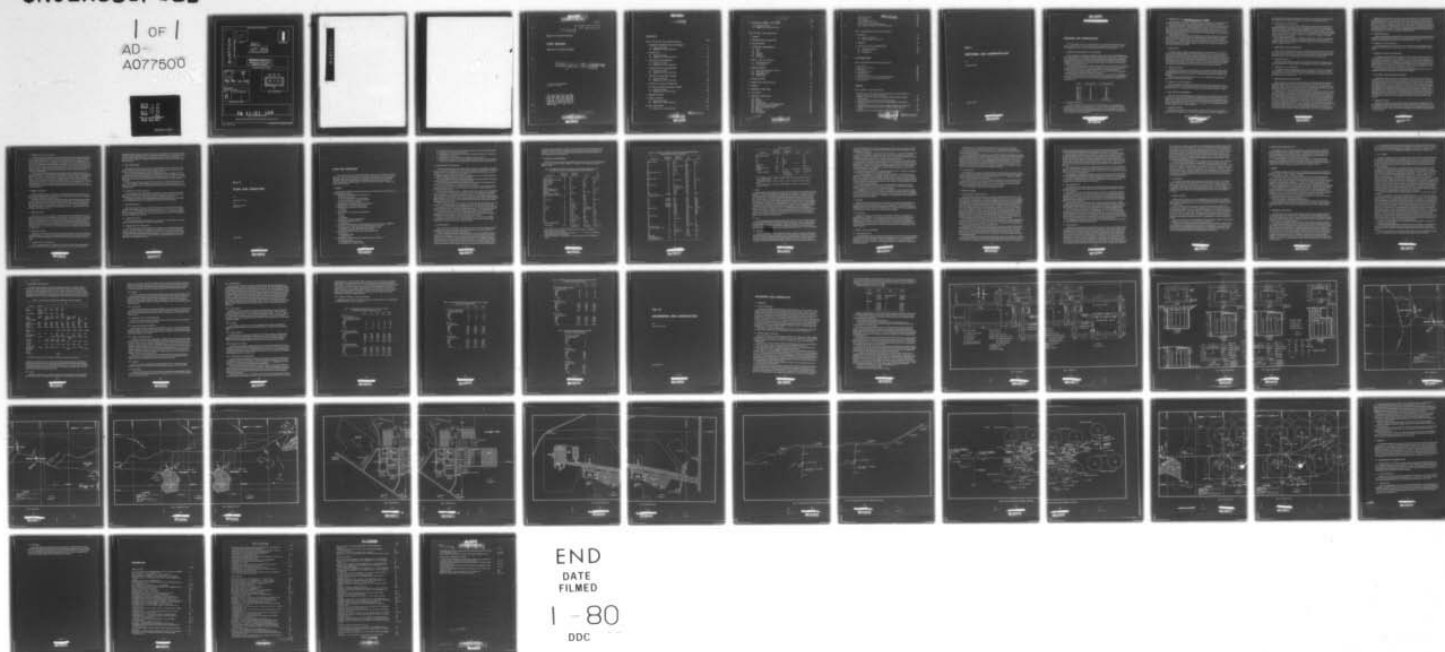
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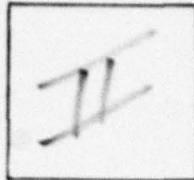
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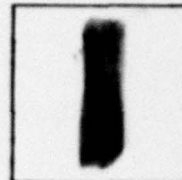
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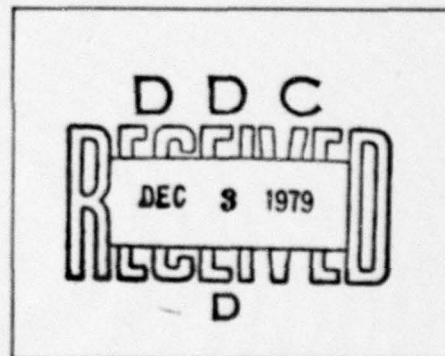
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Report to the Test Director

STAFF REPORTS

Operation Tumbler-Snapper

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Los Alamos Scientific Laboratory
Los Alamos, New Mexico

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Part I

PERSONNEL AND ADMINISTRATION

By

Armand W. Kelly

January 1954

7-8

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PERSONNEL AND ADMINISTRATION

This report takes the form of a brief description of the various activities with which J-1 Section concerned itself. Following each description, significant problems, if any, together with suggestions for improvements during the next operation, will be presented.

1 PERSONNEL ADMINISTRATION AND PROCESSING

At an early stage of the planning, arrangements were made with the AEC Field Office and the Nevada Company for a centralized housing- and personnel-processing office. The J-1 office had a representative of the Test Command and the Test Director's staff to assist the Nevada Company in the assignment to quarters. The Test Director's representative in this office was responsible for reporting to the Los Alamos Scientific Laboratory (LASL) the daily arrivals and departures of LASL personnel.

The centralized housing- and personnel-processing office proved to be a great improvement over the processing methods used for the Buster-Jangle operation, wherein arriving and departing personnel had to process through several offices in various camp locations.

The receiving procedure included the completion of a personnel record card, assignment of quarters, issuance of bedding, and payment for quarters.

The following table shows the number of test personnel, exclusive of Test Command personnel and AEC personnel, who were at the Nevada Proving Grounds (NPG) at various stages of the operation. It is not 100 per cent accurate since many individuals failed to report to the processing office.

| Date | LASL personnel | Total test personnel |
|---------|----------------|----------------------|
| Mar. 2 | 7 | 32 |
| Mar. 15 | 20 | 86 |
| Apr. 1 | 55 | 189 |
| Apr. 15 | 52 | 224 |
| May 1 | 60 | 222 |
| May 15 | 64 | 278 |
| June 1 | 60 | 232 |
| June 18 | 13 | (No record) |

1.1 Significant Problems

One of the problems involved was the failure of test personnel to process through the personnel office upon arrival and departure. As a result, J-1 Section was unable to give accurate reports to LASL of arriving and departing personnel. Payroll changes (on and off the 54-hr week) often were delayed, pending determinations from the individual or his group as to the exact dates of arrival and departure.

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1.2 Suggestions for Future Operations

In future operations it should not be necessary for J-1 Section to have a representative in the Nevada Company housing office to handle processing and billeting of test personnel.

The general housing plan and specific assignments for the test personnel should be written up in detail and turned over to the Nevada Company for execution. Upon arrival of personnel not covered by the detailed assignment schedule, the Nevada Company would contact J-1 for instructions. Daily liaison between J-1 and the Nevada Company through visits to the housing office should prove adequate to provide supervision of the Nevada Company's administration of arriving and departing personnel.

A new system for reporting the arrival and departure of LASL personnel will be required. The Nevada Company should be required to publish a daily Arrivals and Departures Report. Since a record of personnel checking through the housing office has not proved adequate for accurate record on LASL personnel, the Arrivals and Departures Report by the Nevada Company must be augmented by a system designed to ensure accurate notification to LASL of the arrival and departure of personnel.

2 HOUSING PLAN

In the early stages of planning it became apparent that a sizable number of the Test Director's staff (including the Military Effects personnel) would have to be housed in hutments. The reactions of participating groups to hutment housing were generally unfavorable, and, as the operation got under way, participating groups indicated that they would much prefer to house eight men in each room of the barracks rather than assign any of their personnel to hutments. This procedure was permitted, and with the completion of four new barracks (one was assigned to the Test Director's staff) it was possible to house all Test Director personnel in barracks. The hutments originally assigned to the Test Director were turned back to the AEC.

2.1 Significant Problems

The housing of eight men per room proved to be too crowded for adequate comfort during the extended period of time that most test personnel were required to stay at the NPG. The participating groups preferred this, however, to splitting their groups between hutments and barracks.

Some problems regarding barracks rules, i.e., the use of appliances (refrigerators in particular) and steel lockers, developed.

2.2 Suggestions for Future Operations

It is recommended that adequate barracks housing be provided for all personnel in the Director's organization, with the possible exception of military enlisted personnel. In addition, the Test Director or J-1 Section should be allowed to review barracks rules before issuance.

3 OFFICE SPACE AND EQUIPMENT

The J-1 Section compiled office-space and office-equipment requirements from the monthly status reports. The Control Point (CP) space assignments were made well in advance of the operation after consultation with several of the participating groups. Office-equipment requirements were forwarded to the AEC Field Office with the request that the equipment be available about two weeks before the arrival of personnel. J-1 planned to have the equipment placed in the offices before the arrival of test personnel.

3.1 Significant Problems

Delays and postponements in the procurement of office equipment made it impossible to have it placed in the offices prior to the arrival of personnel. As a result the equipping of the

offices was hurried, confusing, and irritating to the users. Items that gave particular trouble were typewriters of the proper carriage size, file safes, and a mimeograph machine.

3.2 Suggestions for Future Operations

It is suggested that in the future the J-1 Section again compile the office-equipment requirements from the monthly status reports, coordinating this with the office-space assignments. The equipment requirements would be transmitted to J-4 Section, which would be responsible for procurement. J-4 and J-1 would cooperate in the proper placement of equipment prior to the arrival of test personnel at the site. It is recommended that the equipment already in place at NPG be left in its present locations. This would greatly lessen the procurement problem during the next operation.

When a participating agency does not submit any office-space or equipment requirements or when it submits what is considered unreasonable requirements, the matter should be immediately negotiated with the originator rather than having any arbitrary substitutions or cancellations made by the AEC or J-1.

4 LABORATORY SPACE AND EQUIPMENT

The J-1 office compiled laboratory-space and equipment requirements from the monthly status reports and negotiated with the AEC and the Test Command for quonset huts to meet the space requirements. A fence was installed around three quonsets which were assigned to the J-1 Section, and only "Q" cleared personnel were allowed to enter the fenced area.

4.1 Significant Problems

After the operation had begun, additional requirements developed for work space in the restricted quonset area. The fenced area proved insufficient to meet all requests for space.

4.2 Suggestions for Future Operations

It is suggested that participating agencies give more thought to the matter of work space well in advance of the start of operations so that early negotiations for quonset-area space sufficient to meet the needs can be accomplished. With 30 quonset huts available there should be enough space for all requirements.

5 MUSTER AND CHECK-POINT CONTROL

Prior to the start of operations it was agreed by the Test Manager and Test Director to eliminate a physical muster of personnel on shot nights. In lieu of the muster an efficient check-point control, together with security sweeps of the target areas, was installed. With the exception of the first shot on Frenchman Flat, where certain administrative difficulties arose because of the double-entrance problem, the system worked very well.

At 2200 hours on -1 day a security sweep of the target areas was made, and an access list was placed in effect. All personnel, except those specifically scheduled to remain until a later hour, were required to leave the test area. According to the Operations Plan for each shot, each organization requiring personnel in the test area after this hour prepared and submitted to J-1 a list of personnel requiring such access. These access lists were consolidated by the Director of the Weapons Development Group and the Director of the Military Effects Group. The lists were supposed to be submitted on -2 day, but in actual practice they often were not submitted until 1200 to 1400 hours on -1 day. In addition to a list of personnel requiring access to the test area after 2200 hours, those personnel needing access after H-3 hour were indicated by an asterisk before their name. All personnel in manned stations in front of the CP were listed by station, together with their telephone number and radio contact identification.

Inasmuch as the check point to the test area was approximately 1 mile in front of the CP, it was necessary that J-1, in the preparation of their official access list, present only those manned stations which were beyond the check point. Those manned stations between the check point and the CP were not listed on the official access lists transmitted to the security office. However, J-1 kept this list available in the event it was necessary to contact any of these people for emergency evacuation. Since the personnel requiring access remained essentially the same (80 to 90 per cent) from one shot to the next, an alphabetized card-file system greatly simplified the preparation of official access lists for the security office.

5.1 Significant Problems

A major problem regarding access lists and check-point procedure was obtaining accurate information from the Weapons Development Group and the Military Effects Group far enough in advance for final preparation and issuance of the lists to the security force.

5.2 Suggestions for Future Operations

It is recommended that in the future every effort be made by the participating groups to deliver the list of personnel requiring access to the J-1 office not later than 1300 on shot day -2 days.

6 CONTROL OF ACCESS TO TOWER CABS

On 9 May the Deputy Test Director appointed G. Felt, R. Houghten, and R. Breer as tower-cab coordinators for Tumbler 2 and V. Josephson, J. Wieneke, and P. O'Brien as tower-cab coordinators for Tumbler 3 and Tumbler 4. The tower-cab coordinators were responsible for the scheduling of activities, the arrangement of equipment in the tower cabs, and the control of personnel access to the tower cabs. The latter was accomplished by the preparation of access lists for each tower cab. These lists were placed in effect 5 to 7 days preceding the shot and were amended only on the authority of the tower-cab coordinators.

The coordinators prepared the access lists in draft form and submitted them to J-1 for preparation and official transmission to the NPG Security Officer.

7 CP CONTROL DURING OPERATIONAL PERIODS

Commencing with Shot 2 a system of access control to the CP from H-6 to H+1 hours was placed in effect. Each group of the test organization was required to submit a list of persons requiring access to the CP during the operational period. These lists were consolidated, reviewed by the Test Director, and turned over to the security office for use at the gate to the CP compound, effective at H-6 hour. The size of the list proved to be burdensome to prepare and administer, and commencing with Shot 6 a new system was installed. All groups of the test organization were requested to submit the names of those personnel who would require an operational pass to the CP for all shots. These persons were then issued a permanent operational pass, which, in addition to their regular NPG badges, would admit them to the CP compound between the hours of H-6 and H+1. Personnel requiring access to the compound for only one shot were issued a temporary operational pass which would grant access for that shot only.

7.1 Significant Problems

Personnel were admitted to the CP compound on an operational pass, regardless of the area designations on their NPG badge, which, in many instances, did not include access to the CP compound. In addition, the security force interpreted an operational pass system to include a check of the CP at H-6 hour to ascertain if all occupants of the area had an operational pass in their possession.

7.2 Suggestions for Future Operations

It is recommended that requests for operational passes include the names, badge number, color, and authorized areas in order that an operational pass will not be issued to a man who is not officially badged to enter the compound. In this respect it has been suggested by the security force that a special area designation on the badge indicate an operational pass to the CP. Such area designation would be included on the badge only upon direct request of the Test Director. This will mean that all badge requests will have to be reviewed by the Test Director when operational access is indicated. The operational pass system would be continued to cover temporary passes and those permanent passes which do not have the operational access included on their NPG badge.

The sole purpose of establishing the operational period and limiting access to the CP during this period was to reduce confusion and congestion within the compound and the building. Security-force control of access at the gate seemed the most logical method of executing this control. As this is not a security matter, no violation was involved by having an individual present in the compound who did not have an operational pass. It was not the intent of the Test Director that the security force should "sweep" the CP for operational passes at H-6. It would seem advisable, therefore, to define in detail the responsibility of the security force in executing operational control and to limit any further action by the security force to prior approval of the Test Director.

8 MESSING FACILITIES

With the completion of the new cafeteria, the messing facilities for test personnel were quite adequate and satisfactory. In general, the food was acceptable, and very few complaints were received regarding the food and service.

In addition, a hot-meal service for personnel working in the field beyond normal working hours was established, and it was operated whenever requests were received for 20 or more hot meals. The service included delivery of hot meals to the CP compound, the Radiological Safety building, and the road intersection 11 miles north of the CP. The traveling cafeteria also delivered snacks to the above locations during the noon hour. This proved to be a very satisfactory and desirable service.

9 VEHICLE CONTROL

Prior to the start of actual operations, a memorandum to participating agencies from the AEC set forth the regulations regarding use of government vehicles at the NPG. It was stated that off-post dispatches of such vehicles would be limited to a very small number, and authorizations for such dispatches were to be issued only by unit supervisors. The Test Director's staff interpreted this to mean the group leaders of the various participating agencies and the leaders of projects and staff sections. During the latter half of the operation, a more stringent control was desired, and all off-post use of government vehicles required the approval of the J-3 staff section.

9.1 Significant Problems

Inasmuch as the commercial bus service was wholly inadequate, both from a schedule and equipment standpoint, test personnel often used government vehicles for missions which could have been accomplished by having an adequate bus service between Camp Mercury and Las Vegas.

9.2 Suggestions for Future Operations

It is recommended that either a satisfactory common carrier with safe and clean equipment and a convenient schedule be obtained or that the AEC operate its own bus schedule

between Camp Mercury and Las Vegas. If this cannot be accomplished, it is felt that the policy regarding off-post dispatches of government vehicles should be liberal. A charter plane service from Las Vegas to Camp Mercury has been suggested and might very well be feasible. Certainly this would eliminate a considerable amount of government-vehicle traffic between Camp Mercury and town.

10 MAIL AND RECORDS

A branch office of the J-Division mail room was established in the J-1 office at the CP to handle incoming and outgoing official mail of the LASL personnel at the proving ground. The distribution of personal mail was also handled through this office.

All incoming mail, official and personal, for LASL personnel was addressed to P.O. Box L, Mercury, Nevada. Other organizations of the Test Director's staff, i.e., Edgerton, Germeshausen & Grier, Naval Research Laboratory, and Air Weather Service, had their own post office boxes and did not receive their mail through the J-1 office as has been the case in previous operations.

The mail was picked up at the post office by a member of J-1 and was delivered to the CP mail room for logging in and distribution. As a carry-over from previous operations, the J-1 mail room continued the service of handling official outgoing mail (including stamps) for groups other than LASL.

10.1 Suggestions for Future Operations

It is recommended that the AEC provide a messenger to operate between the base camp and the CP who will be authorized to pick up mail for LASL personnel and deliver it to the J-1 office in the CP. This would eliminate the necessity for special mail trips by J-1.

Regarding the handling of official outgoing mail for participating groups other than LASL, it is recommended that the AEC be requested to provide this service in the future.

11 RECOVERY PARTIES

Early in the stages of planning, J-12 indicated a need for recovery personnel following each shot. They proposed to have personnel from LASL sent out for each shot to accomplish this recovery. To avoid special trips from LASL for this function, J-1 assumed the responsibility for supplying administrative personnel from the administrative groups to accomplish the recovery of samples after each shot.

11.1 Significant Problems

On the whole the program worked fairly well. However, since the work was on a volunteer basis, it was occasionally difficult to recruit recovery teams.

11.2 Suggestions for Future Operations

It still seems feasible to provide personnel for recovery from the administrative groups. However, one of the conditions of accepting this responsibility should be that the individual agrees to participate in recovery operations for so long a time as his radiation exposure does not exceed the tolerances established for the operation. If it is not possible to recruit enough personnel with such an agreement, it may be necessary to send additional people from the laboratory to accomplish the recovery.

Part II

PLANS AND OPERATIONS

By

William W. Drake, Jr.

and

Lawrence J. Keyes
Major, USAF

August 1952

15-16


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PLANS AND OPERATIONS

A report of the activities of the Plans and Operation Section of the Test Director's staff is given here. The purpose of this report is to record the responsibilities of the Section and the discharge of these responsibilities; the recommendations for improvement of the methods employed; and general recommendations for planning, operations, and administration in future test operations. Detailed treatment of the various topics listed in Sec. 1 makes up the major part of this report.

1 GENERAL

The activities of the Plans and Operations Section of the Test Director's staff fall into the following general categories:

1. Preparation (in conjunction with J-1 Section) of:
 - (a) Administrative order.
 - (b) Chart of organization of test organization.
 - (c) Security procedure in conjunction with AEC.
 - (d) Control Point (CP) organization.
2. Determination of program and project participation.
3. Establishment of a system of status reports.
4. Determination of operational requirements.
 - (a) Vehicular.
 - (b) Aircraft.
5. Determination of communication requirements.
 - (a) Line.
 - (b) Radio.
 - (c) Frequency.
6. Determination of support requirements.
 - (a) Radiological Safety (Rad-Safe).
 - (b) Photographic.
7. Allocation and management of vehicles assigned to the Test Director's organization.
8. Coordination of test requirements with Special Weapons Center (SWC).
 - (a) Determination of test requirements and transmission to SWC.
 - (b) Scheduling of special planes and helicopter flights.
9. Preparation of operation plans, orders, and annexes thereto.
 - (a) Basic plan.
 - (b) Photographic annex.
 - (c) Rad-Safe annex.
10. Preparation of firing-party plan and emergency plans and orders.
 - (a) Firing-party plan.
 - (b) Emergencies involving airdrops.
 - (c) Emergencies involving tower shots.

11. General supervision of the execution of plans and operation orders and their annexes.
12. Coordination of operations with Rad-Safe.
13. Representation of the Test Director in detailed planning and execution of operations pertaining to test activities.
14. Establishment of liaison with the Civil Aeronautics Authority (CAA).
15. Preparation in cooperation with the Field Manager's representative of the communications plan for Nevada Proving Grounds (NPG), including a frequency-allocation chart.

2 ORGANIZATION OF THE SECTION

The Plans and Operations Section consisted of seven personnel, including two clerical and one Air Force major on temporary duty from the SWC. Besides the group leader of J-3 Section and his deputy for the continental tests, there was one laboratory staff employee, who was a member of J-3, and one stenographer on loan from J-1.

Responsibilities at the site were shared by two assistants. Prior to each shot either the J-3 leader or his deputy joined the J-3 group at the NPG.

It is recommended that the J-Division Plans and Operations Section be made up entirely of LASL personnel and not be augmented by military personnel.

To provide continuity between tests and backup for the J-3 group, the Continental Tests Section of J-3 should consist of two civilian laboratory employees.

At the time of the operation one capable secretary, and possibly one clerk, should be provided as secretarial help. If J-1 and J-3 could pool clerical help, it might be possible to reduce this to the one secretary.

It is felt that the operational staff of the Military Effects Test Group could have designated one or two officers to work with the Section at the CP. As it was, cooperation was complete, but it was felt there was a great deal of duplication. Requests for permission to carry out various operations by the Military Effects Test Group were, in some instances, passed through Task Command, J-3, and in most cases through an Operations Section of the Director of Military Effects Test Group staff, whereas they could have been directed to the Test Director's Plans and Operations Section directly.

Time and manpower would have been saved if the Plans and Operations Sections were combined. It is recommended that this be suggested to the Director of Military Effects Tests.

It is further recommended that the Rad-Safe advisor be connected either with the Rad-Safe Group, the Advisory Panel, or the Plans and Operations Section. It is felt that there was more than normal administration of Rad-Safe operations being handled by the Rad-Safe advisor.

In the event there is a Federal Civil Defense Administration (FCDA) program, it is recommended that consideration be given to including a liaison representative on the staff of the Plans and Operations Section to handle FCDA operational problems.

Finally, it is recommended that the SWC designate one or two officers to act as SWC representative at the NPG for the entire operation and that these officers maintain regular hours at the CP, particularly during the operational phase.

3 STATUS REPORTS

Status reports were required the 1st and 15th of each month. The report outlined briefly the purpose of the project or program reporting, its personnel complement, material requirements, operational requirements, and schedule.

The Plans and Operations Section extracted information concerning Rad-Safe, vehicular, communication, photographic, and aircraft requirements; compiled composite reports after screening; and forwarded the reports to the groups concerned with providing such services. Communication and vehicular requirements were forwarded to the Field Manager, NPG, as formal requests for services from the Test Director. Similarly a request for aircraft assistance was sent to the Commanding General, SWC (see Sec. 12, Aircraft Participation). Reports from the Military Effects Test Programs were received as individual reports; however,

a composite report of operational requirements was prepared by the Test Command and forwarded to the Test Director as a request for services from the Commanding Officer, Test Command. These were, in general, approved without modification and were included in the above requests from the Test Director.

4 OPERATIONAL REQUIREMENTS

By February 15 the operational requirements of the principal part of the test organizations, programs, and projects were clearly defined. A summary of the requirements is given in Tables 1a and 1b.

Table 1a—SUMMARY OF VEHICULAR, RADIO, AND LINE REQUIREMENTS FOR THE TEST DIRECTOR'S STAFF AND WEAPONS DEVELOPMENT PROGRAMS

| Program unit | Personnel complement | Vehicular requirement* | Radio† | Line‡ |
|------------------------------|----------------------|-----------------------------------|--------------------------|----------------------|
| Test Director | 6 | 3s | 1c, 3m | 3a, 5x, 1s |
| Deputy, Weapons Development | 10 | 4s, 1p | 1c, 2m | 3a, 1x, 1c |
| Rad-Safe Advisor | 1 | 1s | 1m | 1a |
| Advisory Panel | 7 | 2s | None | None |
| Classification | 3 | 1s | None | 1a |
| Safety | 2 | 1s | None | 1a |
| Weather | 16 | 1s, 11p, 2t | 2hf | ? |
| Special Weapons Center | 14 | 3s | 1s | 2a, 2c, 2s |
| Deputy, Military Effects | 1 | 1s | 1m | 1a |
| Rad-Safe | | 6s, 2p | 3c, 1s, 20m | 2a, 6c |
| Weapon Assembly (Sandia) | 11 | 2s, 1p, 3t | 1f | 1a |
| Weapon Assembly (Los Alamos) | 6 | 1s | None | 1a |
| J-1 | 10 | 2s | None | 1a |
| J-2 | 1 | 1s | None | 1a |
| J-3 (visitors) | 6 | 2s (2s) | None | 3a, 3x, 1s |
| J-4 | 3 | 2p | None | 1a |
| J-6 | 5 | 1s, 1p, 1j | 1c, 2m | 2a |
| J-7 | 1 | 1s or 1p | None | None |
| 10, 11.1 | 56 | 2s, 10p, 1pt | 1f, 2m | 2a |
| 11.2, 19.1 | 95 | 2s, 7p, 3t | 3c, 10m, 2hf | 4a |
| 12.1, 20 | 28 | 2s, 1p, 1j, 1t | EG&G system | 3a |
| 12.2 | 7 | 1s, 2p | None | None |
| 13 | 2 | 1s, 1w | None | None |
| 14 | 23 | 2s, 2p, 1t | 1f | 1a, 1x |
| 15 | 9 | 3s, 1r, 1t, 1w | None | None |
| 16, 17 | 8 | 1s, 1p, 1w, 1t | 3m, 1f | 1a |
| 18 | 12 | 1s, 1pt, 1r, 1j, 1w | None | 1a |
| 19.2 | 16 | 1s, 2p, 1pt, 1w | 2m | None |
| 22 | | 1s, 14p | 1c, 14m | 1a, 1c |
| Documentary Photography | 10 | 1s, 1p, 6j | 1c, 6m | 2a, 1x |
| Total (approx.) | 400 | 51s, 59p, 9j, 5w, 3pt, 2r, 12t | 66m, 11c, 2s, 4f, 13w | 39a, 11x, 10c, 4s |

* The symbols used are: s, sedan; p, pickup; pt, panel truck; j, jeep; r, ranchwagon; w, weapons carrier; and t, 2½-ton truck.

† The symbols used are: m, mobile; f, fixed stations; c, control; w, walkie or handie talkies; s, speaker console; and hf, high frequency.

‡ The symbols used are: a, long distance; c, local only; x, extensions; and s, special line "crash."

Table 1b—SUMMARY OF VEHICULAR, RADIO, AND LINE REQUIREMENTS FOR
MILITARY EFFECTS TEST PROGRAMS

| Program unit | Personnel complement | Vehicular requirement* | Radio† | Line‡ |
|---|-------------------------|---------------------------|------------|-------------|
| Director, Prog. 1 | 5 | 3p, 1s | None | 3a |
| 1.1 | 43 | 6j, 2t | 3w | 1c, 14f |
| 1.2 | 18 | 2c | None | 3c |
| 1.3 | 22 | 1j, 1t, 2p, 2c, 1h | None | 1c |
| 1.4 | 13 | 2c, 1h | None | 1c |
| 1.9 | 5 | 1j, 1p | None | |
| 1.13 | 6 | 1t, 1p | None | 1c |
| Director, Progs. 2, 6, 9 | 5 | 2j | None | 4a |
| 2.1 | 9 | 2j, 1t, 1h | None | 1c |
| 2.2 | 3 | 1j | None | 1c |
| 2.3 | 4 | 1j | None | 1c |
| Director, Prog. 3 | 2 | | None | 2a |
| 3.1 | 74 | 2j, 12t, 11h, 7c | None | 3a, 10f, 1c |
| 3.3 | 2 | 1t | None | 3c |
| 3.4 | 12 | 1t | None | 3c |
| Director, Prog. 4 | 3 | 1j, 1s | None | 2a |
| 4.2 | 10 | 2t, 1p, 1s, 2h | None | 2c |
| 4.3 | 27 | 2j, 4t, 1s, 2c, 4h | None | 2c |
| 4.4 | 7 | 1j, 2t, 2h | None | 2c |
| 4.5 | 22 | None | None | |
| 4.6 | 9 | 1j, 1h | None | 2c |
| Director, Prog. 6 (see Dir., Progs. 2, 6, 9) | Kirtland | None | None | None |
| 6.1 | 8 | 3j | None | 1c |
| 6.2 | Kirtland | None | None | None |
| 6.3 | Kirtland | None | None | None |
| 6.4 | 2 | 1j | None | None |
| 6.5 | Kirtland | None | None | None |
| 6.6 | Kirtland | None | None | None |
| 6.7 | Kirtland | None | None | None |
| Director, Prog. 7 | 7 | 1j, 3s | 4w, 3m, 1f | 3a, 2x, 2c |
| 7.1 | 3 | None | None | None |
| 7.2 | 0 | None | None | None |
| 7.3 | 2 | None | None | None |
| 7.4 | 3 | 1j, 1t, 1s | None | None |
| Director, Prog. 8 | 2 | 1j, 1s | None | 2a |
| 8.1 | 2 | 1t | None | |
| 8.2 | 22 | 2j, 1p, 2c, 1b | None | 1c |
| 8.3 | | | None | 1c |
| 8.4 | 9 | 1j, 1p | None | 2c |
| 8.5 | 3 | 1t | None | 1c |
| 8.6 | 16 | 1c | 3m, 1f, 8w | 2c |
| Director, Prog. 9 (see Dir., Progs. 2, 6, 9) | 0 | None | None | None |
| 9.1 | 15 | 2j, 2t, 2p | None | None |
| 9.2 | 40 | 8p, 2h, 1s, 3c | None | None |
| 9.4 | 5 | 1j | None | 1c |
| 9.5 | 8 | 1j, 1t | None | 1c |
| Commander | 7 | 2s | 9m, 2f | 6a, 1c |
| T-Site Detachment | 21 | | | |
| Deputy, Military Effects | 1 | 1s | | 2a |

Table 1b—(Continued)

| Program unit | Personnel complement | Vehicular requirement* | Radio† | Line‡ |
|-----------------------|----------------------|--|-----------------|----------------------|
| Military Effects Test | | | | 6a |
| J-1 | 21 | 3j | | 3a |
| J-2 | 3 | 1j | | 3a |
| J-3 | 11 | 3j, 1s, 1c | | 8a |
| J-4 | 38 | 1j, 1t | | 2a, 2c |
| J-6 | 6 | 1j, 1p | 1m, 1f | 3a |
| Comptroller | 1 | 1j | | 2a |
| Chaplain | (J-1) | 2j | | 1c, 2x |
| Laundry Detachment | 200 | | | 1a, 1c |
| Rad-Safe | > 62 | 6t, 5t, 2b | (See Table 1a) | (See Table 1a) |
| Aggregate peak total | 820 | 54j, 23p, 24s, 22c, 15h, 3b, 39t, 10 special | 15w, 5f, 13m | 55a, 42c, 24f, 4x |

* The symbols used are: s, sedan; c, carryall; j, jeep; t, $\frac{3}{4}$ -ton truck; p, pickup; h, heavy $2\frac{1}{4}$ -ton truck; and b, bus.

† The symbols used are: f, fixed; m, mobile; c, control; w, walkie talkie; and s, speaker console.

‡ The symbols used are: f, field line; a, long distance; c, local only; x, extensions; and s, special line "crash."

4.1 Radio

Detailed reports were prepared on line and radio requirements and forwarded to the Field Manager. The radio requirements for the Test Director's organization, including Rad-Safe and Test Command, was for approximately 50 fixed and mobile stations on the Weapons Development-Military Effects Test net and approximately 50 mobile and fixed stations on the Rad-Safe-Program 22 net. The initial request to the Field Manager included two-thirds of these requirements. Subsequent requests added substantially to the number required. For example, the establishment of Program 22, Air Sampling and Fall-out Studies, placed an additional load of 14 mobile and 1 fixed station on the Rad-Safe net. In addition to radio-equipment requests, coordination of the allocation of the use by various programs of specific frequencies was required. Lester Krasin of Panhandle Electric Co. was designated by the Field Manager as frequency coordinator. He came to Los Alamos and worked with the Plans and Operations staff on drawing up a frequency-allocation chart and determining what frequencies required the approval of the Federal Communications Commission (FCC). Those requiring governmental approval were forwarded to the AEC, SFOO.

4.2 Line

Line communications were divided into two groups: those in the tower or target areas and associated stations and those in the CP area and the camp-site area. The line requirements for the instrument stations were requested by means of the instrument chart prepared by J-6 and issued by the Office of the Test Director. Telephones required in the CP and the camp site areas were requested by letter from the Plans and Operations Section to the Field Manager.

4.3 Vehicular

Vehicular requirements of the Test Director's staff, including the Weapons Development Programs, were of the order of 130 vehicles, which included sedans, trucks, jeeps, and carryalls. Four-wheel drive requirements were met by the Test Command; vehicular requirements of the Military Effects Test Programs and Rad-Safe were also met by the Test Command. Vehicular requirements submitted by the Military Effects Test Programs and Rad-Safe, there-

fore, were of little interest to the Plans and Operations Section, although ultimately the AEC was asked to furnish several sedans and other equipment to Rad-Safe, taken largely from the Test Director's allotment.

It was the responsibility of the Plans and Operations Section to assist in the administration of the use of motor vehicles. Although this was primarily the responsibility of the Nevada Company and a transportation officer of the AEC, direct contact with the Weapons Development Programs was primarily the concern of the Plans and Operations Section.

This involved the reshuffling of the assigned vehicles to meet special requirements of the test groups and the requesting of additional vehicles of the Field Manager when experimental programs were unexpectedly enlarged, requiring as a result additional transportation facilities. Occasionally a member of the test groups violated established motor-pool or traffic regulations, thereby requiring an investigation of the AEC charge, an explanation thereof, and rectification, if possible, of the situation.

It was also the responsibility of the Plans and Operations Section to handle the assignment of the vehicles provided for visitors and panel members.

It is recommended that as close liaison with the Field Manager be maintained in future operations as was established in the Tumbler-Snapper operation. It is further recommended that no action be taken by the Field Manager affecting vehicles allocated to the use of the Test Director's organization without first clearing that action with the Plans and Operations Section. In this way those few misunderstandings which occurred during the Tumbler-Snapper operation will be avoided in future operations.

It is recommended that attention be given to the possibility of assigning pool cars to members of the Test Director's staff as the need arises rather than permanent assignment such as in the case of the security and classification officers.

The suggestion of a CP motor pool deserves consideration. Certainly pickups and larger trucks could be parked in the CP area, and more comfortable and speedy means of transportation could be employed for movement to and from the CP area and Camp 3. Also, the possibility of a "hot" motor pool deserves serious consideration, eliminating the necessity of decontaminating the majority of hot vehicles.

4.4 Rad-Safe

In order to give the Rad-Safe officer some concept of the magnitude of the Rad-Safe job at NPG, particularly as it involved postshot recovery operations, Project leaders were requested to state in general terms their requirements. These were compiled by the Plans and Operations Section and forwarded to the Rad-Safe officer. Subsequently the requirements were more definitively stated as the plans for each shot were prepared.

4.5 Photographic

Similarly, photographic requirements were collected. Documentary photographic requirements were forwarded to the Documentary Photography Unit. Special requirements for paper, film, film storage, etc., were obtained in advance and permitted the Documentary Photography Unit to prepare to provide adequate service. Those projects and programs desiring to expose and process their own film were required to register as photographic units, as outlined in the Photographic Annex, Annex R to the Test Director's Operation Order 1-52, Tumbler-Snapper.

5 JOINT J-1 AND J-3 ACTIVITIES

5.1 Administrative Order

The administrative order was prepared and distributed by the Personnel and Administration Section of the Test Director's staff. It was the responsibility, however, of the Plans and Operations Section to prepare Annexes A, C, and E in conjunction with J-1 and Annexes H and I. These are in that order, Organization, Intelligence and Security, Transportation, Meteorology, and Communications.

Appendix I to Annex A consisted of the organization chart for the NPG operations.

As a result of a joint AEC, Task Command, J-1, J-3, and D-Division conference on security, the Test Manager issued a bulletin on security procedures, which became Annex C to the Administrative Order.

It is recommended that the organization chart for NPG operations be simplified if possible. It has been suggested that the deputies to the Test Director could be combined with the positions of directors of test programs. In this respect the assignment of the directors should have the approval of the Test Director to ensure the appointment of an individual who would work in harmony with the Test Director. The Rad-Safe advisor should be a member of the Rad-Safe Group or the Advisory Panel rather than a member of the staff of the Test Director. The Engineering and Construction Section should include a representative of the military, rather than the military having a representative in the AEC Field Office.

5.2 CP Organization

CP organization was a matter of general discussion involving practically the entire staff of the Test Director and the AEC. The final organization was found to be generally satisfactory except for those groups operating in Room 223. These were J-1, J-6, Classification, Safety, New York Operations Office, and Program 22.

It is recommended that J-1 and J-6 be situated in separate offices and that organizations not particularly busy, but whose presence at the CP is required, be in Room 223. This then would leave Classification, Safety, NYOO, Fall-out, and Air-sampling Studies and possibly, because of the desirability of a central location, the J-1 mail room.

The J-1 administrative offices should be separately located.

6 OPERATION ORDER

6.1 Basic Plans and Schedule of Events

The Test Director's Operation Order 1-52, Tumbler-Snapper, was issued Feb. 2, 1952, approximately 1½ months prior to the operational phase of the operation. Prior to the preparation of the order, meetings held in Albuquerque established program and project participation. A photography plan, Rad-Safe plan, and annexes containing special instructions and schedules of events for the shots were prepared later and issued at appropriate times. The order had general distribution totalling 225. Subsequently this was reduced to 140. Eight days prior to each shot the Military Effects Test Group submitted a schedule of events for Test Programs 1 to 9. Test Command forwarded a copy of the Desert Rock operation plan (Program 5) and submitted a schedule for the observer groups and other Test Command participants. These plans were considered collectively along with the Weapons Development schedule. The Rad-Safe plan of Desert Rock was examined by the Rad-Safe advisor who informed the Plans and Operations Section of the adequacy of the plan and of its conformation with established rules set down in the Rad-Safe plan, Annex R of the Test Director's Operation Order.

The communication plan of the Desert Rock plan was examined by the Plans and Operations Section and cleared with the AEC Communications Branch and the Test Command Communications Officer. This plan was considered in relation to other broadcasts to be made during the period 30 min before shot time to 15 min after shot time.

The evacuation plan and the march tables were also of particular interest to the Plans and Operations Section. The march tables were condensed and printed in the special instructions for each shot in order to afford test participants information concerning traffic on the highways. The entire Desert Rock operation was rehearsed, and the movement forward and the execution of the evacuation plan was observed by members of the Plans and Operations Section and the Rad-Safe advisor.

Information relevant to a Weapons Development operation plan was assembled by a personal interview with the Project Director. This was not involved or difficult for there were not more than 10 people to be consulted, and these were readily available for interview. In this manner

paper work involving the writing of plans by these directors was eliminated, questions were resolved, and the plan obtained was therefore generally acceptable in the beginning.

The four plans mentioned above were integrated as one schedule of events for the shot. Aircraft participation was also included at first but eventually was restricted exclusively to a second schedule entitled Aircraft Participation, which included test and support aircraft. Certain aircraft items of particular interest to participants were included in the schedule of events. The aircraft participation was obtained through consultation with the SWC group and test-aircraft and support-aircraft officers. Special courier flights, if any, were set up at this time. The annex for each shot was usually issued and distributed four or five days prior to shot day.

It is recommended that a study of the composition of the operations order and annexes be made. It is understood that the armed forces have completed a new guide to the preparation of operation orders and plans. Possibly this guide could be of value in the preparation of an order for the next series of continental tests.

It would appear that the annexes pertaining to shots could be more limited in their distribution, and possibly less detailed, provided participating groups submitted more detailed plans.

The AEC promulgated general rules affecting evacuation of the NPG. It is recommended that the Plans and Operations Section cooperate with the Office of Test Operations in producing a fairly explicit plan of operation of evacuation.

6.2 Photographic Annex

The photographic annex to the Test Director's operation plan was essentially the same as that used during the Buster-Jangle operation. Operations using this annex were not at first very well organized.

There was a great deal of discussion and doubt of the definition of sensitized materials. This problem had to be met by the classification officer since all sensitized materials were considered for classification and security purposes "Secret Restricted Data" after exposure. This was largely resolved by the issuance of a modification to the photography plan defining sensitized material and photographic devices (see page P-3 of the Test Director's Operation Order 1-52, Tumbler-Snapper).

Although registration of photographic units, storage and processing groups, and photographers was required, there was no real control over the photographic situation at NPG. Any group desiring to take photographs wrote the Test Director. The Plans and Operations staff then placed the name of the group on the registered list of approved photographic groups.

It is recommended that registration, the designation of an official photographer, and registration of cameras be spelled out in the photographic plan. It is further recommended that the responsibilities involved in registration and security control be specifically stated by the Test Manager. During the operation registration of the photographers and cameras was in doubt at first, and the procedure for registration was agreed upon through consultation between Security and Plans and Operations. This should be clearly defined beforehand.

It is suggested that a clearer definition be made of the responsibilities and areas of operation of the Documentary Photography Unit (LASL).

6.3 Manned Stations

The problem of manned stations was an ever-present one. There were two distinct groups involved, the test participants and the Desert Rock participants. The primary concern of the Test Manager and Test Director, other than the safety of the Desert Rock participants, was the effect of military troop participation on the Effects and Development tests. Through complete cooperation on the part of the Desert Rock Commanding General and his staff and the excellent liaison afforded by the Test Command, J-5, this interference was minimal. Once participation in a particular shot was agreed upon in Washington, arrangements for participation involving a military-equipment-display area, the preparation of an entrenchment area, and routes and times of march were agreed upon with the Engineering and Construction Section and the Plans and Operations Section of the Test Director's staff. The Desert Rock entrench-

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ment area was in all cases at least 7000 yd from the proposed point of detonation and 3 miles from the extremes of the bombing tracks, in the case of airdrops. Desert Rock troops participated in Shots 3, 4, 6, and 7. In Shots 3, 4, and 6 the forward movement of the participating troops did not commence until the initial Rad-Safe survey of the area was complete (or R hour, the hour when recovery operations began), and movement then was under the control of the Commanding General of Desert Rock. On Shot 7 forward movement began shortly after the passage of the shock wave. Movement in this case was to the $\frac{1}{2}$ -r region. The Desert Rock participants were required to restrict the total integrated dose for each individual for the entire Tumbler-Snapper operation to 3 r.

Test-participant-manned stations were not less than 6 miles from the point of detonation. In some cases, where wind direction or inaccessibility of the station made it desirable, evacuation of the station occurred at H + 10 min. Evacuation was scheduled in advance. In no case was it necessary to make emergency procedures for evacuation. All projects with manned stations were required to submit lists of personnel to J-1 on D-2 day. Telephones, backed up radio communication, or being in the range of the CP loud speaker was in all cases required. Telephones were either installed upon request of the AEC Communications Branch as permanent stations or as special requirements. In some instances the Test Command arranged to provide field phone service.

6.4 Bombing Runs

The movement of the bomb-carrying aircraft was of particular interest. The bombing pattern conformed with certain safety restrictions. The principal restriction was that the bomb aircraft was not to fly in a direction, or on a course, which would put the bomb, should it be dropped accidentally, dangerously close to populated areas, i.e., the CP, Camp 3, or Indian Springs. The bombing tracks were restricted to the sectors 60° to 125° and 240° to 305° at Station 3 in Area 7, Yucca Flat. At Frenchman Lake the sectors were 223° to 303° and 64° to 123°.

7 OTHER ACTIVITIES

Timing signal and power dry runs were conducted daily at 1000 and 1500. A complete power dry run was held at 1000 D-2 day. The Plans and Operations Section ensured that all radio-frequency transmissions were on the air to be certain there was no interference with other experiments.

Special arrangements were necessary for the settling and spotting of Project 19.2b antiaircraft guns, Program 18 argon flash experiment, Project 19.1b high explosive-micro-barograph experiments, etc. Security and the Field Manager had to be notified in order that all concerned with work in the areas could plan to avoid being in the vicinity of the experiment at the time it was to be cleared. The job of notifying the AEC and their safety officer was turned over to the LASL safety officer. Coordination of the operation with other test groups and the final scheduling of the experiment were the responsibility of the Plans and Operation Section.

Notices were issued to all test participants of the time and place of danger. Usually these experiments were conducted at an early or late hour of the day.

Similarly, after the tower areas became contaminated it was necessary to issue a map of the contamination as it changed from day to day due to wind and decay. The information was transmitted to the Plans and Operations Section daily by the Rad-Safe group officer. Distribution included the Field Manager, for forwarding to the contractors, Test Command, and directors of Weapons Development and Military Effects Test Programs.

8 FIRING-PARTY OPERATION PLAN

The complement of the Firing Party was kept at a reasonable minimum for each shot. Part of the party consisted of persons detailed to making last-minute checks on equipment. The Plans and Operations representative was not required on the last two shots since it became evident that the routine of arming the bomb was sufficiently set that the Plans and Operations representative could be of more value at the CP.

It is recommended that the Firing-party Plan be modified to conform with what now appears to be an established procedure. The system of tower-cab coordinators should be incorporated in the plan. The fact that an access list will be used should also be included. It might be well to add the emergency procedures involving weapons on towers.

9 MISFIRE

Shot 6 failed to detonate on schedule after all timing and firing signals were cabled from the control room at the CP to the tower. The plan entitled Emergencies Involving Weapons on Towers, dated Apr. 14, 1952, J-11040, was invoked.

A meeting of the Test Director and the Firing Party was held immediately after zero time. A full report of the technical procedures involved was made by the Test Director to the Director, LASL. After the analysis of the probable state of the firing system and associated equipment, a disarming team composed of J. C. Clark, B. J. O'Keefe, John Wieneke, and C. Leverton (J-6) proceeded to the tower area to disarm the bomb. Communication via a conference net including the Office of the Test Director, the tower, and Station 330 was established.

Prior to the departure of the disarming team for the tower, all Desert Rock troop participants, official observers, and manned stations forward of the CP, except Station 460, were evacuated. This was accomplished largely in the first $\frac{1}{2}$ hour; complete evacuation was effected by H+1 hour. CAA precautions taken the previous evening were kept in effect until after the bomb was disarmed, until late morning, shot time being around 5 o'clock PDT.

The Gate 2, normally closed from 1 hr before the shot until after R hour after the shot, remained closed until after the bomb was disarmed.

A delay of two days in the scheduled shot date resulted.

It is recommended that a detailed plan of operation be written prior to tower testing, outlining the schedule of events in disarming the bomb and the activities of others concerned. This would include evacuation procedure, modifications to power system, communications, etc.

10 EMERGENCY OPERATIONS

The AEC is primarily concerned with emergency operations, particularly as they affect outlying communities. The manager, SFO, in a memorandum to the Field Manager, NPG, Dec. 29, 1951, Symbol MAR, subject: Planning for Emergency Operations at Operation Snapper, referred to the Scientific Test Director's organization as available for assistance in the preparation of a plan for emergency operations.

These plans were ultimately made by the Office of Test Operations (OTO) around April 1. So far as the Plans and Operations Section was concerned the Office of the Test Director was not consulted. The plans provided a general outline for the evacuation of the CP area, Camp 3, Mercury, and the surrounding towns. To implement these plans, the Plans and Operations Section assisted in providing tight control and accounting for all personnel in the test area at the CP and north of the CP in the target areas. This was done by requiring the registration of all manned stations with the Plans and Operations Section and the provision of rosters to the Personnel and Administration Section. In addition, communication was required, usually telephone, to all stations. Three hours before shot time the Plans and Operations Section discussed evacuation and the manned stations with the head of the Security Force for the CP area and the test area.

It is recommended that the present plans be examined by the Plans and Operations Section; that recommendations be prepared for the coordination of the preparation of a plan, in particular for the NPG; and that the possibility of a rehearsal of evacuation be conducted on AX day of each series of tests. The recommendations mentioned would be for the Test Director.

11 CAA LIAISON

The CAA is responsible for the coordination of air traffic throughout the United States and for publishing warnings and notices of particular interest to aviators. The detonation, flash, and cloud of a nuclear detonation are all real hazards to aviation. For this reason the Plans and Operations Section wrote L. Ponton de Arce, Deputy Chief Airways Operations Division, CAA in Los Angeles, informing him of the tests and of the need for a liaison man at the CP during the operation.

Shortly thereafter Ponton de Arce informed the Plans and Operations Section by letter that Harold G. Greenleaf would be the CAA liaison officer and that a meeting should be held approximately two weeks before the beginning of the operation to discuss plans. This meeting was held at SWC headquarters, Kirtland Air Force Base, Mar. 5, 1952. A record of this conference may be found in the Plans and Operations Section file on Tumbler-Snapper (5.4 conference). Representatives of J-3 (LASL), SWC, and CAA were present. The CAA district managers throughout Region 4 (Salt Lake City, Albuquerque, and Las Vegas) and other interested areas were present. The SWC operation plan was made available to these district managers, all of whom had either military secret, top secret, or Q clearances. Agreement was reached on the procedure to be used when notification of the proposed drop date and approximate time of take-off of the strike aircraft was received by the CAA. Agreement was reached on the altitudes to be closed in the case of the bomb drop (strike) aircraft. This was 12,000 and 14,000 ft MSL between Albuquerque and Las Vegas. The airways were closed at these altitudes until clearance was given by the CAA representative from the CP, NPG, or Kirtland.

All other operational aircraft filed IFR flight plans at Kirtland for the flight to Las Vegas and return.

It was the responsibility of the Plans and Operations Section to inform Greenleaf of the Salt Lake office of the test. Greenleaf arrived early in the evening on D-1 day. After the 2000 weather meeting Col C. A. Spohn, weather officer familiar with cloud physics, would meet with the CAA representative and a Plans and Operations Section representative. Recommendations for closing airways and altitudes in various areas were made, and a tentative alert to all aircraft was prepared by the liaison officer and the Salt Lake regional office of the CAA to be released to all aviators at 2400. The times of closure bracketed the shot time to avoid compromise. The action taken by the CAA representative became effective at 2400 if there was no 2400 weather meeting or after the 2400 meeting if the meeting still indicated an "execute" was in order. Depending on weather conditions, wind velocities and direction at various altitudes, probability of rain, and cloud coverage, the shot was either planned or postponed. Wind directions varying in altitude produced angular shear and spread the cloud out in azimuth. Wind velocity varying as well in altitude produced shear in altitude and with some parts of the cloud moving faster than others. For these reasons the SWC provided two aircraft (see Sec. 12.9) to report to the CP the position of the cloud and its parts.

A report of the action taken by the CAA liaison officer was transmitted in writing to the Test Manager and Test Director.

As the conditions developed and were reported to the CP, modification or cancellation of previously issued notifications of air-space closure were made by the CAA liaison officer. This was done after consultation with the Air Weather Officer and the Plans and Operations Section.

It is recommended that this meeting of the LASL, SWC, and CAA representatives be held for all future operations and that a representative of the OTO be invited to attend.

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12 AIRCRAFT PARTICIPATION

On Jan. 23, 1952, the Deputy Test Director dispatched a letter to the Special Projects Officer, SWC, USAF, outlining air-support requirements for Operation Tumbler-Snapper. A reply was received stating the methods by which air-support requirements would be fulfilled and specific types and quantities of aircraft which could be furnished. The original air-support requirements were modified and enlarged from time to time during the tests and are dealt with individually by mission in the following paragraphs. Table 2 shows (test) aircraft participation.

Table 2 — TEST-AIRCRAFT PARTICIPATION, OPERATION TUMBLER-SNAPPER*

| Aircraft | Rehearsal | Shot | | | | | | | |
|-----------------------------------|--------------------|---------|--------|--------------|------------|------------------|--------|---------------|--------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Drop | B50 | B50 | B50 | B50 | B45 | | | | |
| Disaster | C47(AB) C47(SB) | C47 | C47 | C47 | C47 | | | | |
| Telemetry | B29(AB) | B29 | B29 | B29 | B29 B50 | | | | |
| IBDA | 3/B50 | 3/B50 | 3/B50 | 3/B50 | 3/B50 | 3/B50 | 3/B50 | | |
| Track 1 | B29 | B29(AB) | B29 | B29 | B29 | B29(AB) | B29 | B29 | B29 |
| Track 2 (backup) | | B29 | | | | B29 | | B29 (NYOO) | |
| Track 4 | B25 | B25 | B25 | B25 | B25 | B25 | B25 | B25 | B25 |
| Sampler control | B29 | B29 | B29 | B29 | B29 | B29 | B29 | B29 | B29 |
| Sampler 1 | B29 | B29 | B29 | B29 | B29 | B29 | B29 | B29 | B29 |
| Sampler 2, 3, 4, 5 | 4/T33 | 4/T33 | 4/T33 | 4/T33 | 4/T33 | 4/T33 | 4/T33 | 4/T33 | 4/T33 |
| Sampler 6, 7, 8, 9, 10, 11 | | | | 5/F84G | 5/F84G | 5/F84G | 6/F84G | 6/F84G | 5/F84G |
| Photo | C47 | C47 | C47 | C47 | C47 | C47 | C47 | C47 | C47 |
| SAC Pathfinder | | | | B50 | B50 | | B50 | B50 | |
| SAC IBDA | 3/B50 | | 12/B50 | 12/B50 | 12/B50 | (CANX) 12/B36 | 7/B50 | 12/B50 | B36 |
| SAC photo | | 4/B50 | 2/B29 | 2/B36 | 2/B29 | | | | |
| Terrain survey 47 | C47 | 2/C47 | 2/C47 | 2/C47 | 2/C47 | 2/C47 | 2/C47 | 2/C47 | 2/C47 |
| Terrain survey L-20 | | L-20 | L-20 | 2/L20 | 2/L20 | 2/L20 | 2/L20 | L20 | 2/L20 |
| Helicopter H-12 | (AOCP) | (AOCP) | (AOCP) | H-12 | H-12 | H-12 | H-12 | H-12(SB) | |
| Paragauge or free air blast | | | | | | 2/B29 | | | 2/B29 |
| Paradrop | | | | 5/C46 C47 | | | | | |

* AB, abort; SB, standby; AOCP, aircraft out of commission for parts; CANX, cancelled.

In addition to providing aircraft for participation, SWC provided personnel for the purpose of maintaining operational control of all aircraft which operated over the NPG. These personnel maintained an operations room, provided by the Test Director, which was adjacent to the Plans and Operations Section offices in the CP. Ground radio operators for ground-to-air communication were provided by the Sandia Corporation.

12.1 Strike

The Deputy Test Director, in his letter of January 23, requested SWC to furnish B-50 type aircraft for the purpose of dropping the test weapons. This requirement was later modified,

and the new requirement submitted requested a strike aircraft capable of handling the type of weapon to be detonated on this operation. SWC furnished B-50 type aircraft for the first three airdrops and furnished a B-45 type aircraft for the fourth and last airdrop, Shot 4, inasmuch as the B-50 type aircraft could not accommodate the particular type of unit being tested.

12.2 Disaster

A C-47 type disaster aircraft was provided for the purpose of escorting the strike aircraft on each airdrop. The mission of the disaster aircraft was that of ensuring that trained personnel and specialized equipment would be quickly available in any area in which an aircraft disaster involving a nuclear weapon occurred. Consequently, a nucleus of trained medical personnel and radiological monitors accompanied the disaster aircraft for possible duty during each airdrop shot.

12.3 Telemetering

A B-29 telemetering aircraft was provided by SWC on the first four shots. The B-50 strike aircraft was also instrumented for additional telemetering purposes on the airdrop shots and served as an additional telemetering aircraft on Shot 4, in which the B-45 was utilized as the strike aircraft.

12.4 Paragauge (Free-air Blast Measurement)

Rome Air Development Center provided two B-29's which were utilized to drop canisters in order to obtain free-air blast measurements.

12.5 Indirect-bomb-damage Assessment

Three B-50 aircraft were utilized on each shot except 7 and 8 for indirect-bomb-damage assessment (IBDA). These aircraft were provided by the Strategic Air Command (SAC), 509th Bomb Wing, Walker Air Force Base, Roswell, N. Mex., and staged at Kirtland Air Force Base under the operational control of SWC.

12.6 Sampler and Sampler Control

A B-29 aircraft was utilized on each shot as a sampler control aircraft, helping to utilize the actual sampler aircraft to the best advantage. The actual sampling was done by four T-33 jet-fighter type aircraft, four samples being desired per shot. A B-29 aircraft which had been previously used as a sampler aircraft on Operation Buster-Jangle and which was still instrumented for sampling operations was also utilized as a sampler aircraft on each shot. The B-29 sampler control aircraft was utilized on each shot as a sampler backup. The four T-33 aircraft were augmented on Shots 3 to 8 by five F-84G type aircraft which were included at the request of Task Group 132.4 for the purpose of training the pilots and calibrating the instrumentation of the aircraft for Operation Ivy.

The function of the sampler aircraft was to monitor the movement, shearing, and dispersion of the cloud from detonation time until the conclusion of the sampling operations in order to determine the altitude and direction of movement of the cloud.

12.7 Observer

There is no record of participation of the SAC observer aircraft. This aircraft was supplied by either SAC or the School of Aviation Medicine and was not controlled by SWC.

12.8 Photographic

One specially instrumented C-47 type aircraft was furnished by Lookout Mountain Laboratory, USAF, for the purpose of flying photo crews at shot time to secure better motion pictures and still coverage of all shots.

12.9 Cloud Tracking

One B-29 and one B-25 type aircraft were provided on each shot for the purpose of determining the extent of areas of contamination. Civil air traffic was then protected from danger of contamination through the closing of the airways by the CAA. The CAA representative was on duty at the CP during each shot, as mentioned above. The B-29 aircraft operated at levels from 15,000 to 29,000 ft, whereas the B-25 aircraft operated at altitudes from ground level to 15,000 ft. The B-29 tracking aircraft was provided by the AWS, USAF, and the B-25 was furnished by the SWC. An additional B-29 aircraft was provided for the purpose of permitting the tracking of several clouds in the event that severe shearing took place and also to back up the B-29 and/or B-25 in the event of an aborted mission. This additional aircraft was used on Shots 1 and 5 when the original B-29 was forced to abort and also on Shot 7 at the special request of the NYOO in order to follow the cloud to a point much farther from the NPG than had been done previously.

12.10 Terrain Survey

Additional aircraft provided for the purpose of performing aerial surveys of ground contamination consisted of two C-47's, two L-20's, and one H-12 helicopter. The two C-47 aircraft participated on each shot. One L-20 aircraft participated on Shots 1, 2, 4, and 7, whereas two L-20 aircraft participated on all other shots. The helicopter was unable to participate until Shot 3, being out of commission because of inability to secure spare parts, but participated regularly thereafter.

12.11 Paradrop

Five C-46 type aircraft and one C-47 aerial ambulance were used for the purpose of transporting the paratroopers to and from the NPG and also to the jump point on Charlie day, Shot 3.

12.12 Logistic Support

The 4901st Support Wing (Atomic), Kirtland Air Force Base, N. Mex., provided aircraft for security patrols and transportation of personnel and cargo and furnished aircraft to the 4925th Test Group for accomplishment of their terrain survey and tracking commitments. Tables 3 to 6 give a detailed breakdown of missions, hours, and miles by aircraft type.

12.13 Strategic Air Command

The SAC was represented by different IBDA aircraft on each shot except Shot 1. On four occasions a pathfinder preceded the IBDA aircraft over Ground Zero in order to obtain accurate wind direction and velocity. This permitted the IBDA aircraft to accurately place themselves in predetermined positions relative to the burst at the time of the burst. The SAC also operated certain photo aircraft on all airdrop shots.

12.14 Conclusions and Recommendations

Aircraft participation appeared to be adequately provided during the entire operation, with the exception of helicopter participation. In view of the extremely complex nature of this type of aircraft, which seems to preclude effective field maintenance, it is suggested that an alternate means of accomplishing the desired mission be attempted.

On future tests it would seem desirable to establish a passenger and freight department which would have exclusive control of all air movement of freight and passengers so that movement priorities could be established which would result in less confusion and relieve the Test Director of the time-consuming and bothersome task of determining priorities and settling differences and disputes.

It should be pointed out that at Los Alamos the Director's office, Supply and Property Department, Personnel Department, J-Division, J-3, J-1, and the Division office were all involved,

from time to time, in various phases of SWC air service to the site. Similarly at Nevada the Field Manager, Las Vegas Field Office, and his representatives, test participants, Sandia, EG&G, LASL, the Test Director, J-1, J-3, J-4 (SP Department representative), and AEC, OTO, were involved. It is remarkable that there were not more situations where this lack of coordination did not result in complete disorganization. This is probably due to the excellent spirit of cooperation evidenced by the SWC. The AEC, LASL, and contractors can present a better front by establishing a central agency, in operation 7 days a week, at each end, Albuquerque and Nevada, to handle this traffic.

12.15 Appendix: Summary of Aircraft Participation

Supplemental information of test-support activities at Indian Springs, Nev., during Operation Tumbler-Snapper, is given in Tables 3 to 6.

Table 3—BREAKDOWN BY MONTH AND AIRCRAFT TYPE OF FLIGHTS
TRANSPORTING PERSONNEL AND/OR CARGO

| | B-25 | C-47 | C-45 | L-20 | Total |
|-----------------------------|--------|--------|--------|-------|--------|
| Flights originating at | | | | | |
| Indian Springs transporting | | | | | |
| personnel and/or cargo: | | | | | |
| March | 7 | 9 | 11 | 2 | 29 |
| April | 9 | 6 | 18 | 15 | 48 |
| May | 14 | 13 | 12 | 6 | 45 |
| June | 4 | 2 | 3 | 3 | 12 |
| Total | 34 | 30 | 44 | 26 | 134 |
| Miles flown transporting | | | | | |
| personnel and/or cargo: | | | | | |
| March | 2770 | 3540 | 3847 | 280 | 10437 |
| April | 9490 | 2830 | 5885 | 1765 | 19970 |
| May | 8620 | 7700 | 4820 | 610 | 21750 |
| June | 6845 | 2140 | 1190 | 200 | 10375 |
| Total | 27725 | 16210 | 15742 | 2855 | 62532 |
| Hours flown transporting | | | | | |
| personnel and/or cargo: | | | | | |
| March | 14:10 | 23:10 | 24:35 | 2:30 | 64:25 |
| April | 49:40 | 37:45 | 42:40 | 17:45 | 147:50 |
| May | 48:50 | 43:30 | 33:55 | 5:15 | 131:30 |
| June | 32:20 | 12:55 | 9:00 | 1:45 | 56:00 |
| Total | 145:00 | 117:20 | 110:10 | 27:15 | 399:45 |

Table 4—BREAKDOWN BY MONTH AND AIRCRAFT TYPE OF FLIGHTS
UTILIZED FOR TERRAIN SURVEY

| | C-47 | L-20 | Total |
|---|--------|-------|--------|
| Terrain-survey flights originating at Indian Springs: | | | |
| March | 2 | 1 | 3 |
| April | 10 | 6 | 16 |
| May | 14 | 5 | 19 |
| June | 7 | 5 | 12 |
| Total | 33 | 17 | 50 |
| Miles flown on terrain surveys: | | | |
| March | 780 | 250 | 1030 |
| April | 5260 | 1920 | 7180 |
| May | 7631 | 1460 | 9091 |
| June | 4975 | 1440 | 6415 |
| Total | 18646 | 5070 | 23716 |
| Hours flown on terrain surveys: | | | |
| March | 6:15 | 2:50 | 9:05 |
| April | 37:45 | 17:30 | 55:15 |
| May | 51:50 | 12:20 | 64:10 |
| June | 26:15 | 11:55 | 38:10 |
| Total | 122:05 | 44:35 | 166:40 |

Table 5—BREAKDOWN BY MONTH AND AIRCRAFT TYPE OF FLIGHTS
UTILIZED FOR SECURITY PATROLS

| | C-45 | L-20 | Total |
|---|--------|-------|--------|
| Security-patrol flights originating at Indian Springs: | | | |
| March | 25 | 1 | 26 |
| April | 40 | 10 | 50 |
| May | 24 | 31 | 55 |
| June | 4 | 3 | 7 |
| Total | 93 | 45 | 138 |
| Miles flown on security patrols: | | | |
| March | 3971 | 200 | 4171 |
| April | 7080 | 1350 | 8430 |
| May | 4440 | 4950 | 9390 |
| June | 770 | 560 | 1330 |
| Total | 16261 | 7060 | 23321 |
| Hours flown on security patrols: | | | |
| March | 33:05 | 1:55 | 35:00 |
| April | 51:20 | 16:45 | 68:05 |
| May | 31:45 | 48:40 | 80:25 |
| June | 4:45 | 4:35 | 9:20 |
| Total | 120:55 | 71:55 | 192:50 |

Table 6—BREAKDOWN BY MONTH OF B-25 FLIGHTS
UTILIZED ON TRACKER MISSIONS

| | |
|---|-------|
| Tracker flights originating at Indian Springs: | |
| March | 1 |
| April | 3 |
| May | 3 |
| June | 2 |
| Total | 9 |
| Miles flown on tracker flights: | |
| March | 270 |
| April | 2520 |
| May | 2550 |
| June | 1750 |
| Total | 7090 |
| Hours flown on tracker flights: | |
| March | 1:20 |
| April | 12:35 |
| May | 13:10 |
| June | 8:50 |
| Total | 35:55 |

Part III

ENGINEERING AND CONSTRUCTION

By

Robert H. Campbell

February 1952

35-36


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ENGINEERING AND CONSTRUCTION

1 NARRATIVE

1.1 Scope of This Report

Construction planning and the establishing of basic requirements for this operation were handled by the Test Director's office (LASL), the Department of Defense (DOD), and the AEC [Santa Fe Operations Office (SFOO) and Nevada Proving Grounds (NPG)], jointly. Details of construction requirements for scientific programs were gathered by LASL, J-6 Group, and requirements for military-effects-test construction were gathered by the office of CDR L. N. Saunders. Such requirements were forwarded to AEC and were given by them to the construction contractors. Details of construction will be found in the reports of the various scientific groups, and blueprints and maps are on file at the LASL, J-6 office, and in the office of Silas Mason Co. at Las Vegas, Nev. A compilation of total scientific construction is to be found in the instrument chart for Operation Tumbler-Snapper, prepared by LASL, J-6. Base facility maps and plans are on file at the J-6 office, also.

This report is a short narrative history of the course of Tumbler-Snapper construction. It does not include information readily available from the above-mentioned sources.

1.2 Tumbler-Snapper Construction

During the latter part of the Buster-Jangle operation, the first plans for Tumbler-Snapper were agreed on in conferences, the Test Director's office, AEC (SFOO), and J-6 participating. Following are general requirements which were submitted to the AEC, NPG (LASL Memorandum J-8371).

Areas T-1, T-2, T-3, T-4, and T-7 were to be activated with all necessary rehabilitation of Area 7 after Buster-Jangle, including renewal of the existing asphalt at T-7-1.

Five more 300-ft 3-leg 10-ton-capacity towers were ordered, with modifications from previous designs suggested by experiences at Operation Greenhouse.

For Areas 1, 2, 3, and 4, instrument blockhouses similar to the blockhouse, Station 100, of Buster-Jangle were designed, 2000 ft from each zero point, adjacent to the access roads (see Fig. 1). The blockhouses were to have inside dimensions of 15 by 25 by 9 ft, peak pressure of 70 lb/sq in., and instrument power of 75 kw. These blockhouses were placed underground, with a 10-ft earth cover, stabilized with shot asphalt. Adjacent to the blockhouses small concrete structures were built (underground) to house time-signal relays, power-supply transformers, and communications terminal blocks (see Fig. 2).

Detector stations similar to those in Area 7 were built for each blockhouse, and a coax was run to them in 10-ft deep ditches.

Each area had an electrical transformer capacity (for scientific instrumentation) totaling 300 kw, distributed at the blockhouse (above) and at the tower bases at zero points. (At the tower bases heavy concrete blockhouses were built to try to establish permanent transformer locations. These blockhouses were destroyed by the shots, and it was decided that in the future power to the immediate tower area, except for the small amounts for scientific instrumenta-

tion, would be supplied by portable transformer stations, to be moved out before each shot.) During the fall and winter (1951 and 1952), the actual shot schedule for Tumbler-Snapper was worked out, and, while construction proceeded on the basic layout for each of the areas, experimental programs were worked out in detail.

The shot schedule as fired was as follows:

| Shot | Date | Area | Type |
|----------|---------|----------------|---------|
| Tumbler: | | | |
| 1 | 4/1/52 | Frenchman Flat | Airdrop |
| 2 | 4/15/52 | 7-3 | Airdrop |
| 3 | 4/22/52 | 7-3 | Airdrop |
| Snapper: | | | |
| 1 | 5/1/52 | 7-3 | Airdrop |
| 2 | 5/7/52 | 1 | Tower |
| 3 | 5/25/52 | 4 | Tower |
| 4 | 6/1/52 | 3 | Tower |
| 5 | 6/5/52 | 2 | Tower |

SFOO chose Silas Mason Co. to handle architectural-engineering design and supervision for Tumbler-Snapper during the winter and let contracts for basic construction as follows:

1. Lembke, Clough & King Co. erected four towers and built the area blockhouses and other heavy concrete construction.
2. Road expansion was handled by Wells Cargo.
3. Electrical-transmission-line extension was put in by Reynolds Electric Co.
4. A water line to supply Mercury from Frenchman Flat wells was built by Pipe Line Construction Co. (see Figs. 3 and 4).

The camp areas were enlarged with five new dormitories, three Butler Building warehouses, a recreation building, a new cafeteria, and an administration building (see Fig. 5). Buster-Jangle experience showed that the Control Building communication and administration facilities were not large enough; therefore for Tumbler-Snapper the administrative sections of the operation were moved to the camp area, and direct long-distance and site communication were provided there.

At the CP area (Fig. 6) the Radiological-Safety (Rad-Safe) building was remodeled inside to take advantage of Buster experience, and the security fencing was rerun to place the Rad-Safe building outside the restricted area, permitting noncleared personnel to use its facilities. On the slope west of the CP, an instrument building, Station 400, was built for use by groups measuring thermal radiation and air attenuation.

In January the Test Director's office, when advised that the Federal Civil Defense Agency (FCDA) was proposing extensive tests and planning for increased DOD participation, activated Frenchman Flat as an additional target area. Requirements for the area were established in LASL Document J-9459. The facilities installed are described below:

1. A blast line was established, due west from the chosen zero point, 4000 ft long. (It might be noted that this blast line was instrumented in a manner similar to the blast line established at Area 3 in Yucca Flat. The Area 3 blast line was 4000 yd long, giving blast measurements of the same nature but changed by a factor of 3.) This blast-line construction included 12- to 50-ft towers placed at regular intervals from zero to 4000 ft as well as instrumentation for sound velocity, dust loading, mass motion, temperature changes, density changes, and ground-shock propagation, with all necessary supporting recording blockhouses.
2. A blacktop-road system for access to Frenchman Flat zero.
3. Extensive rocket-launcher facilities.
4. Photo stations and Air Weather Service stations.

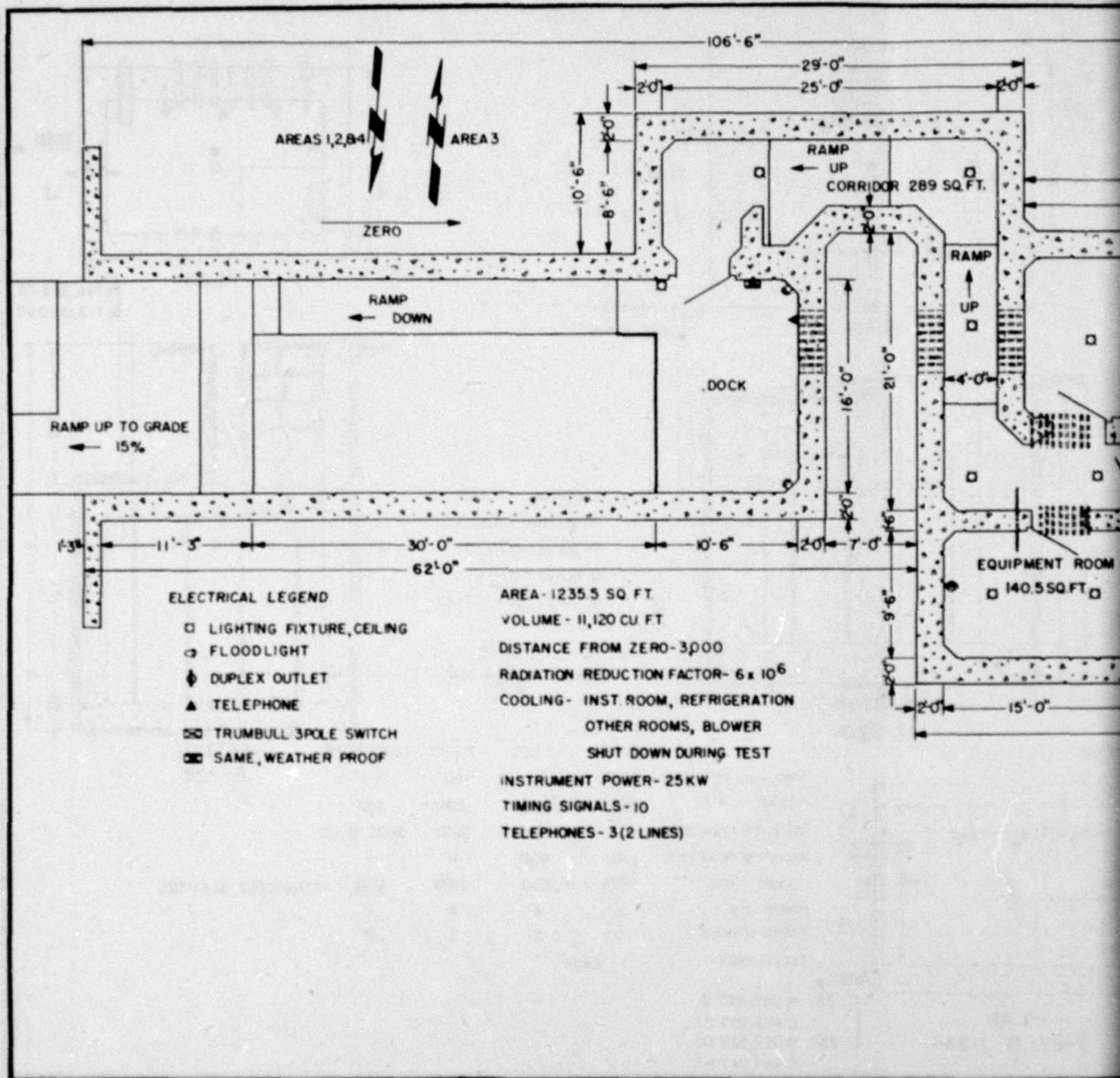


Fig. 1—Station 300.

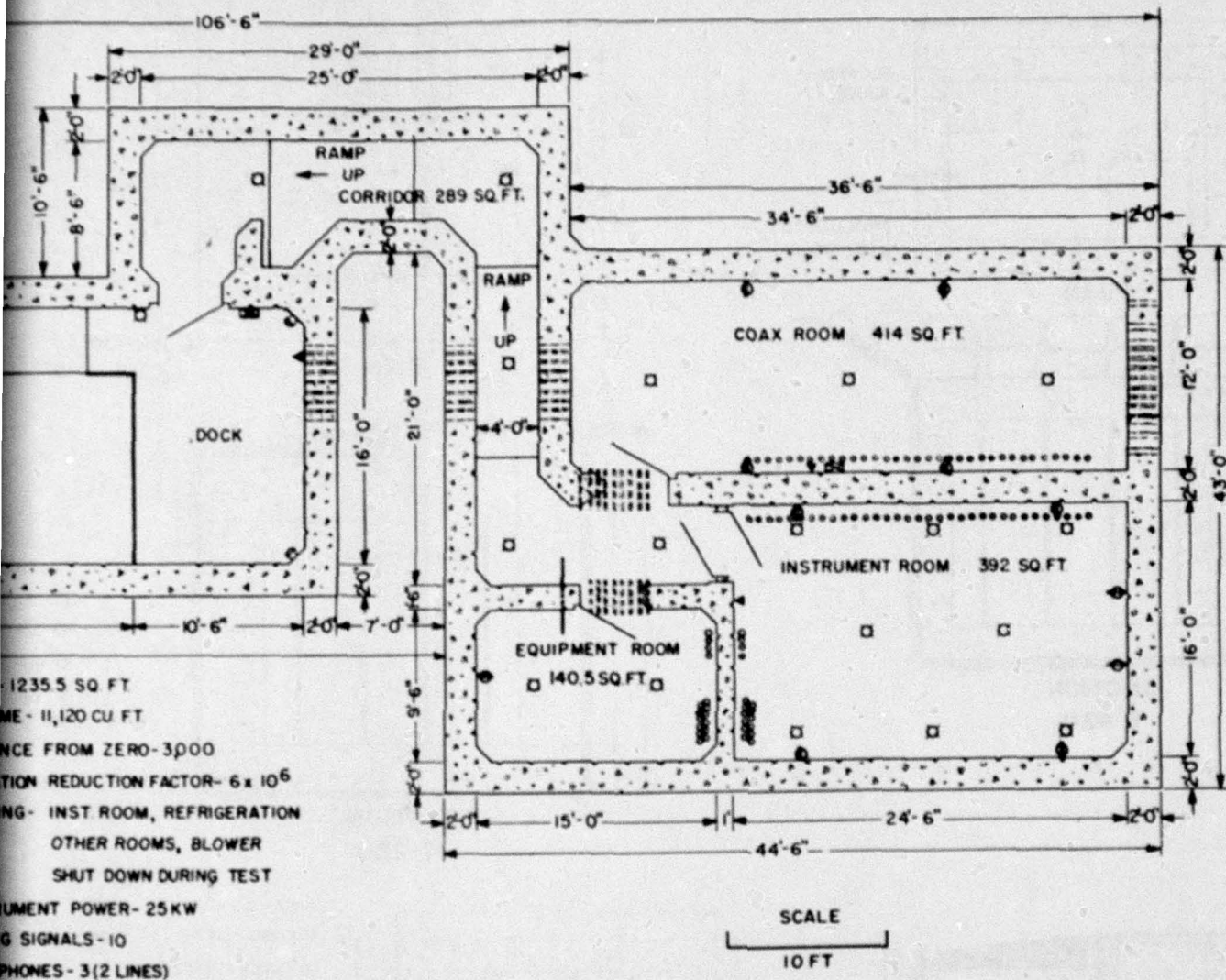


Fig. 1—Station 300.

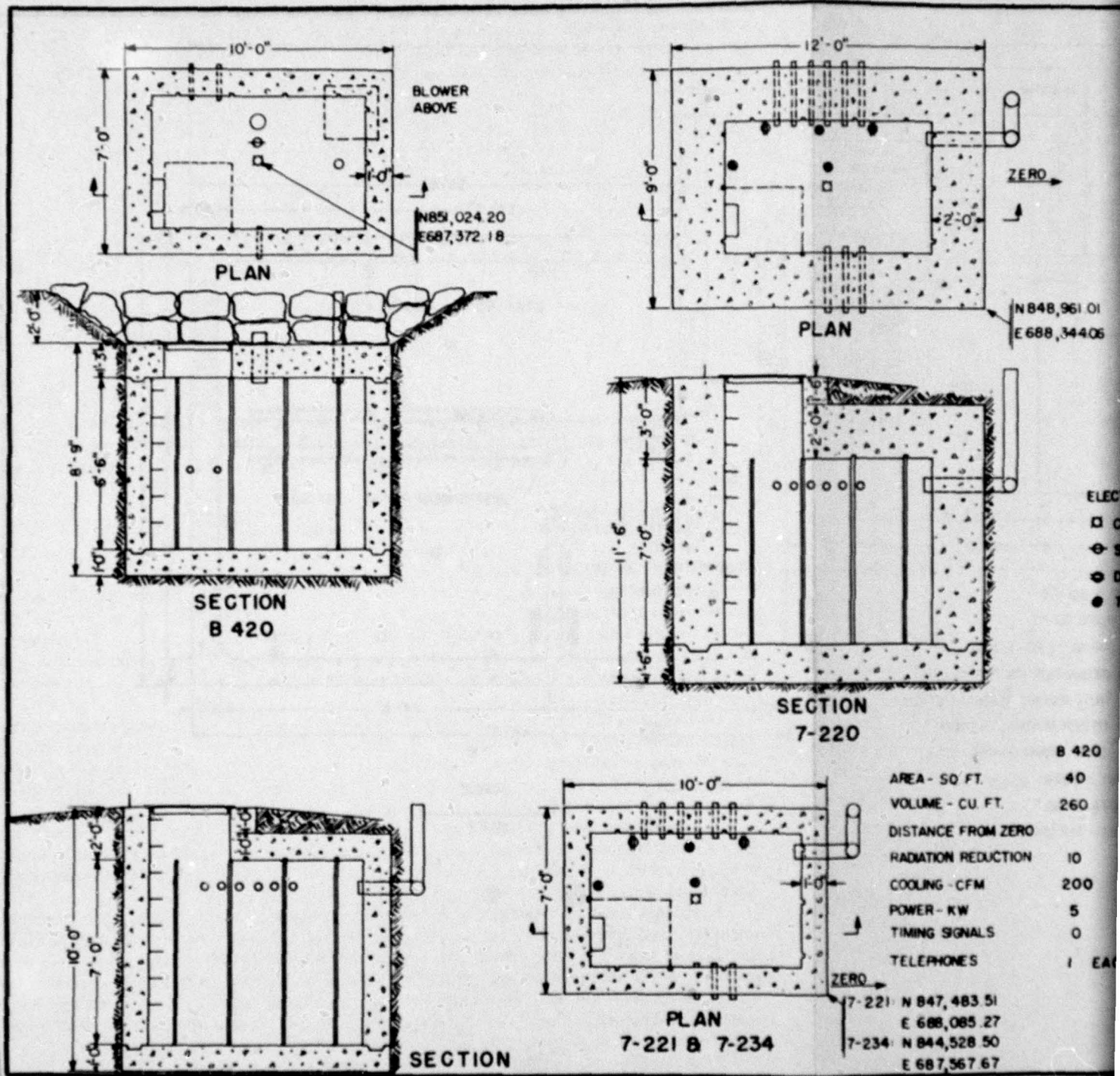
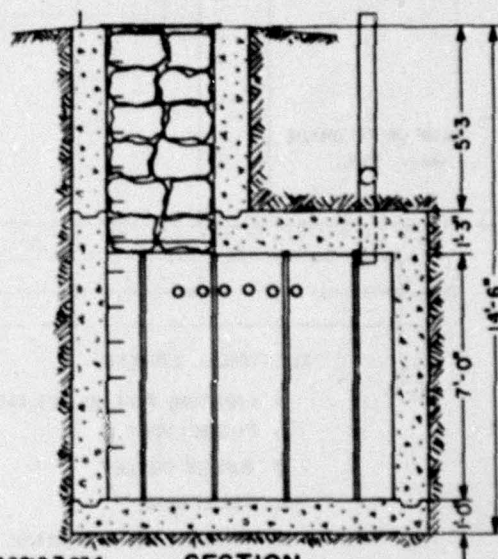
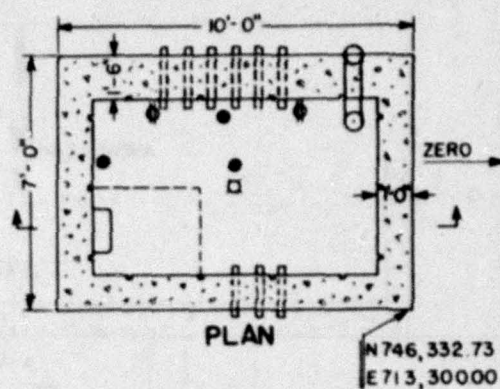


Fig. 2—Small concrete shelters.

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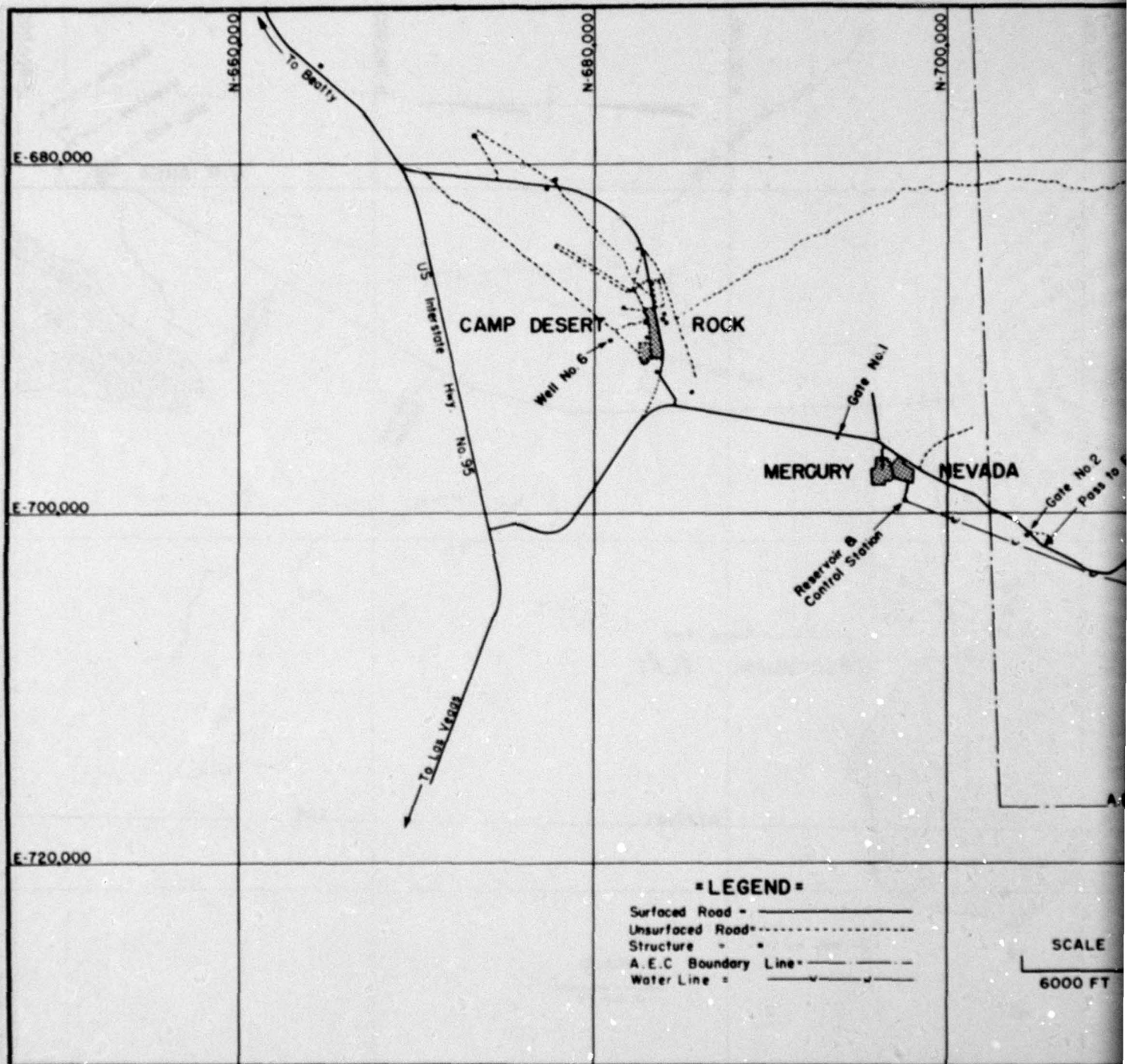


Fig. 3—Camp area.

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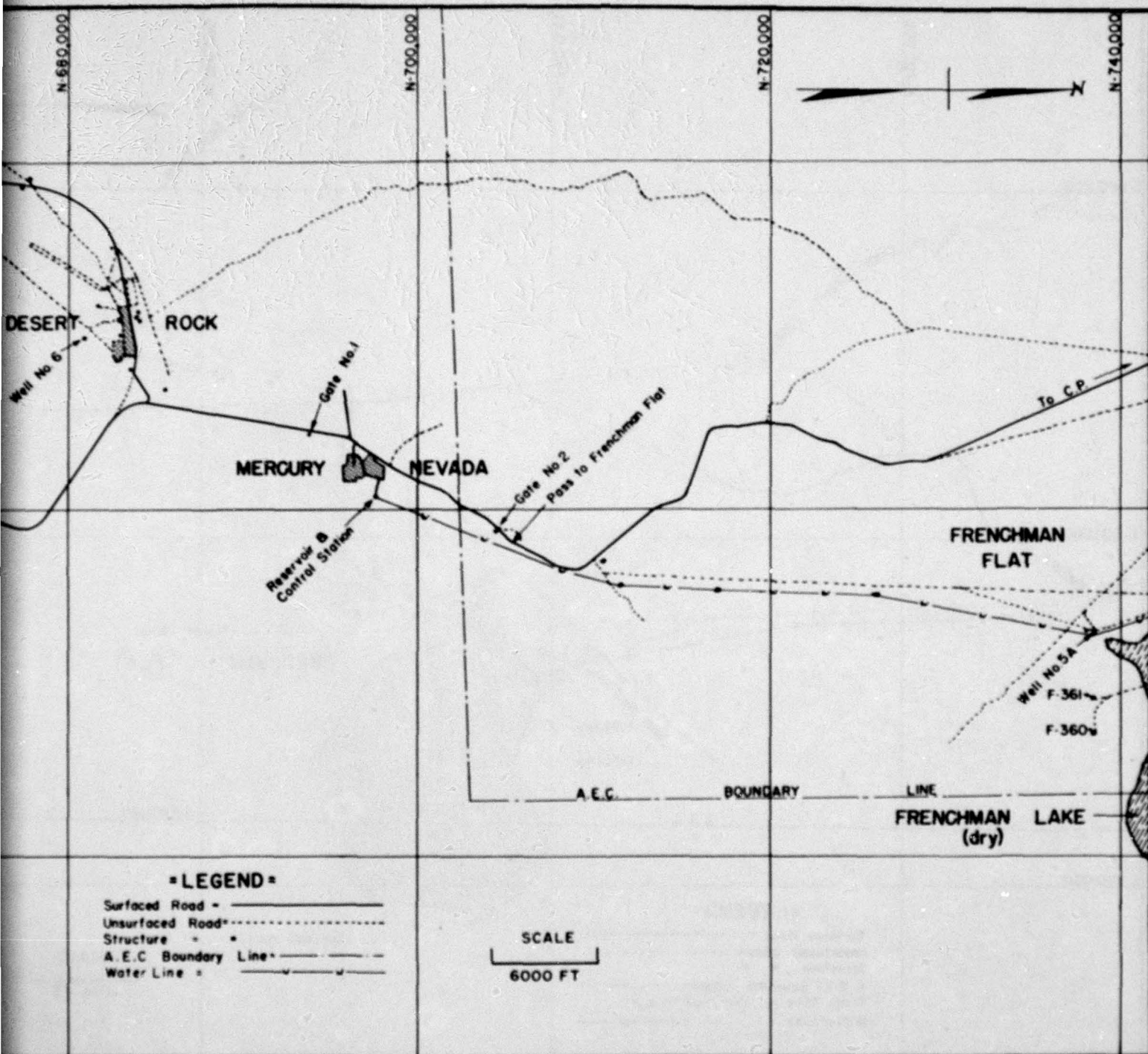


Fig. 3—Camp area.

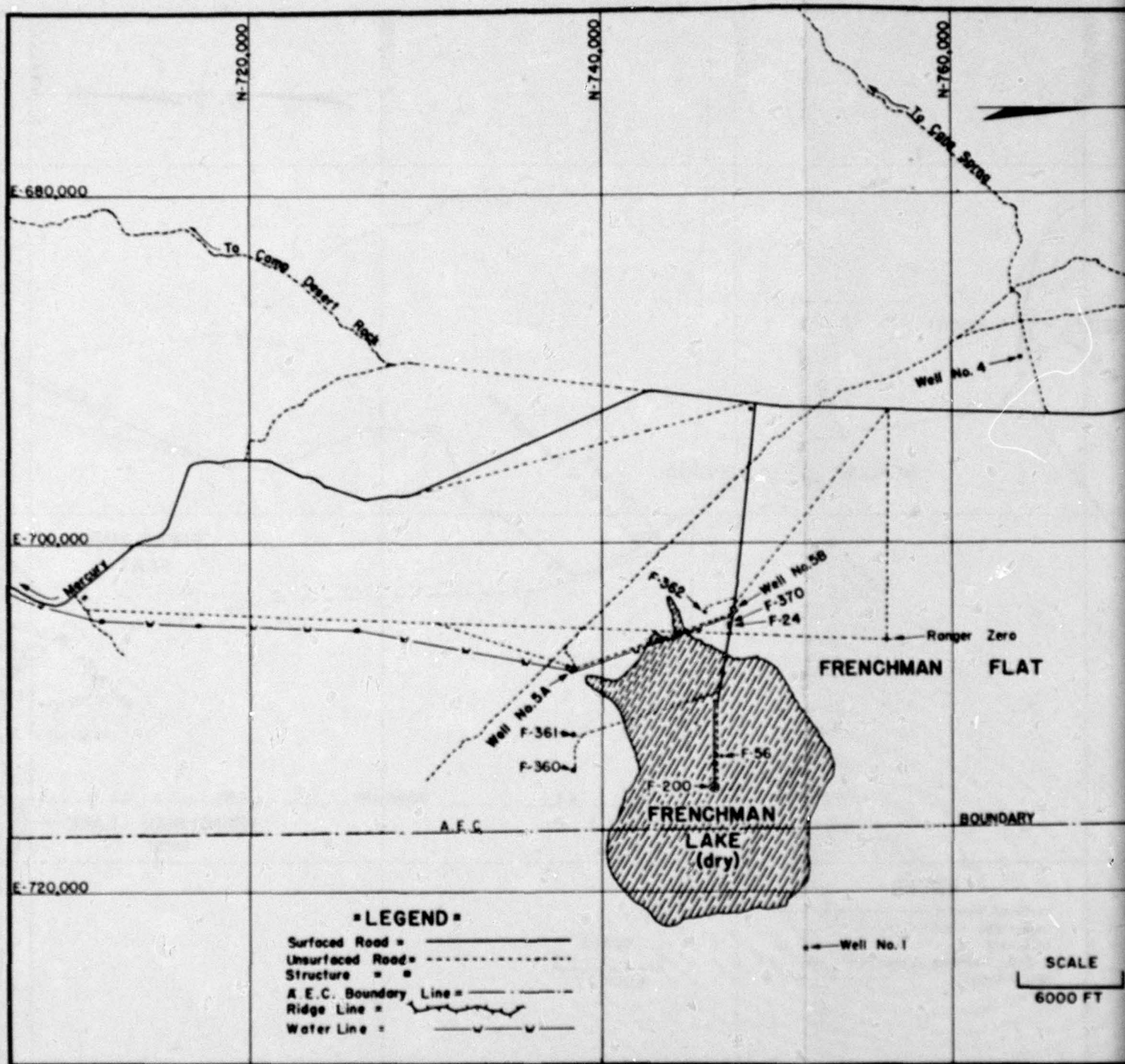


Fig. 4—Frenchman Flat area.

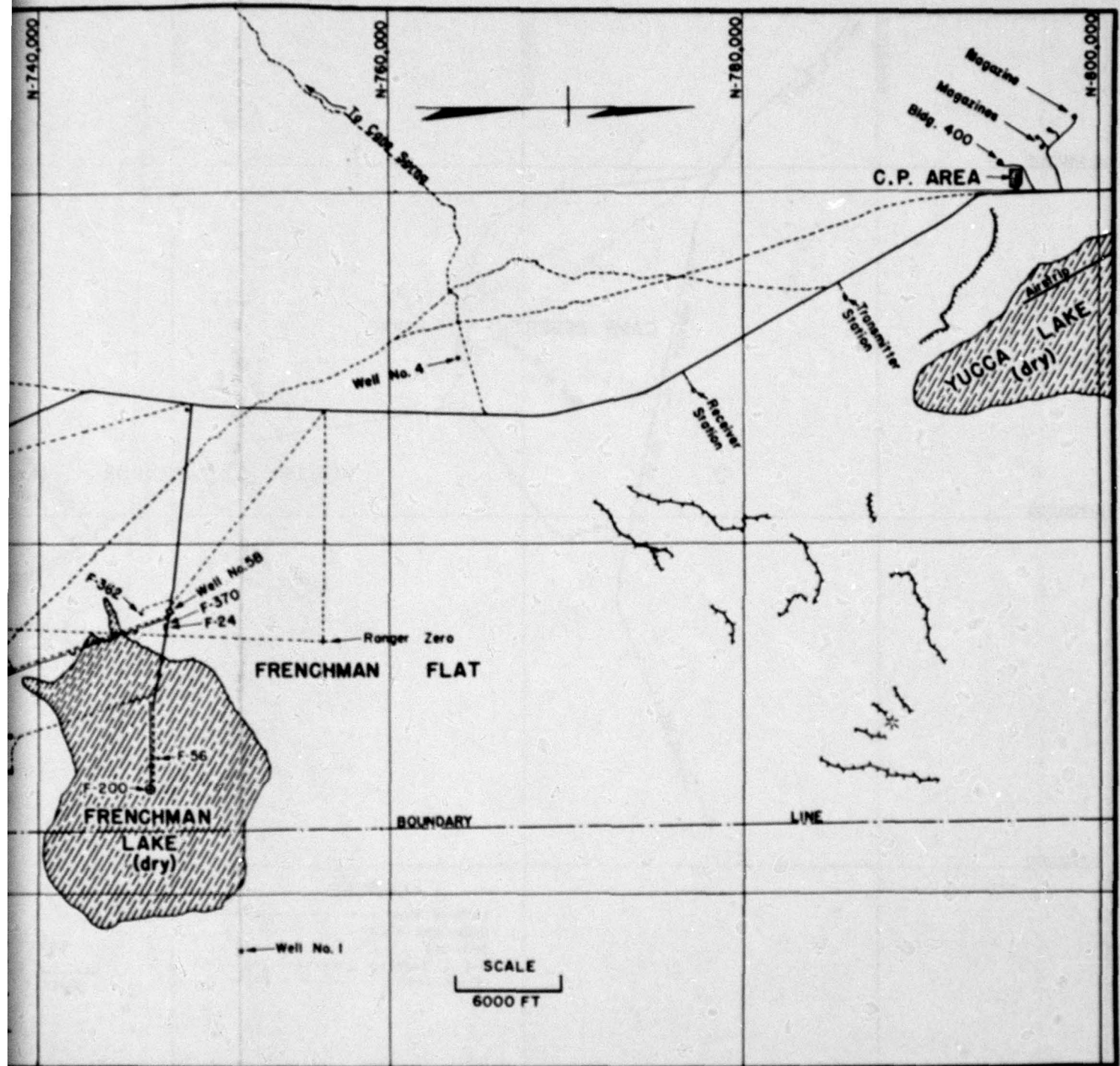


Fig. 4—Frenchman Flat area.

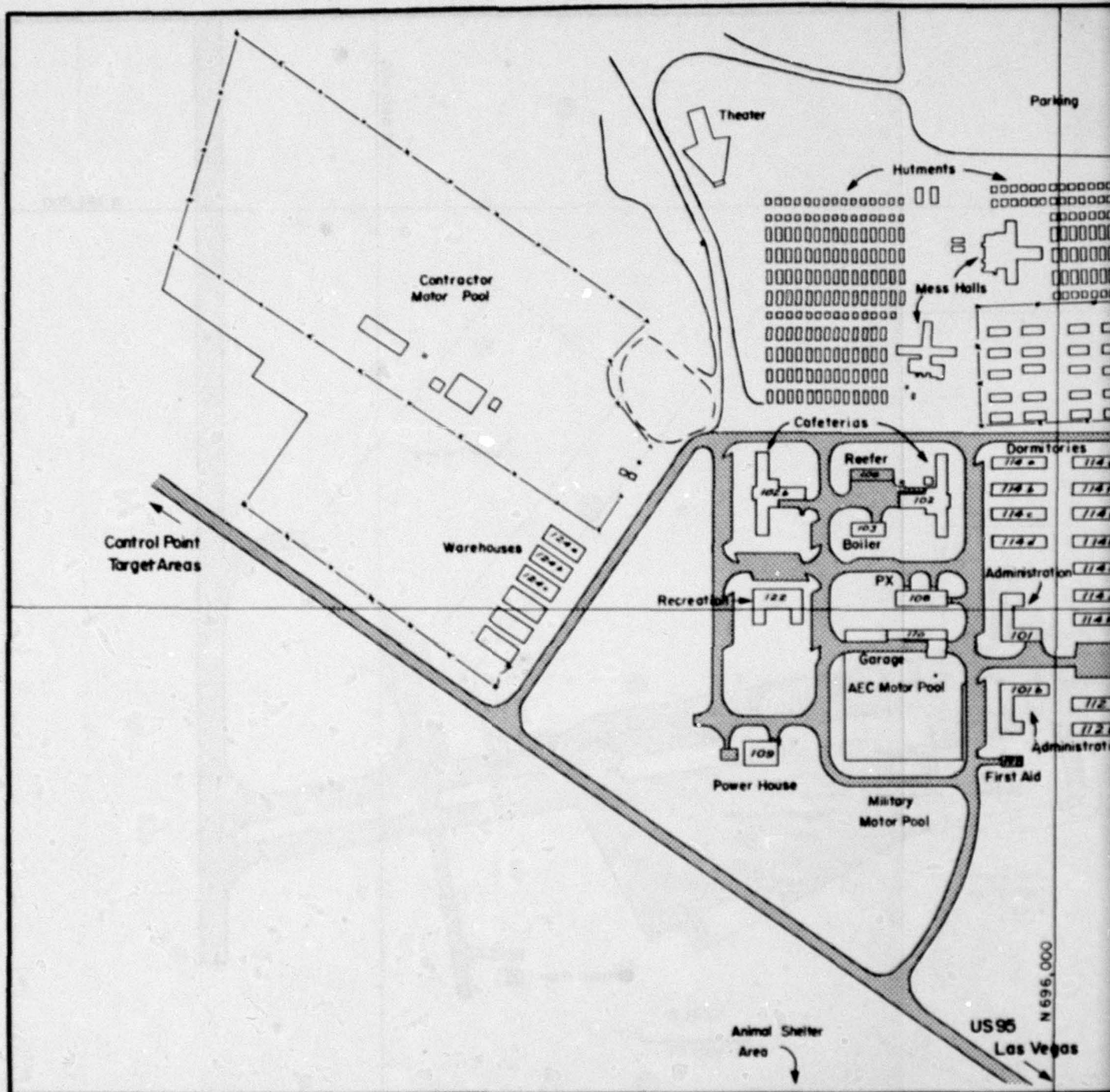


Fig. 5—Camp Mercury.

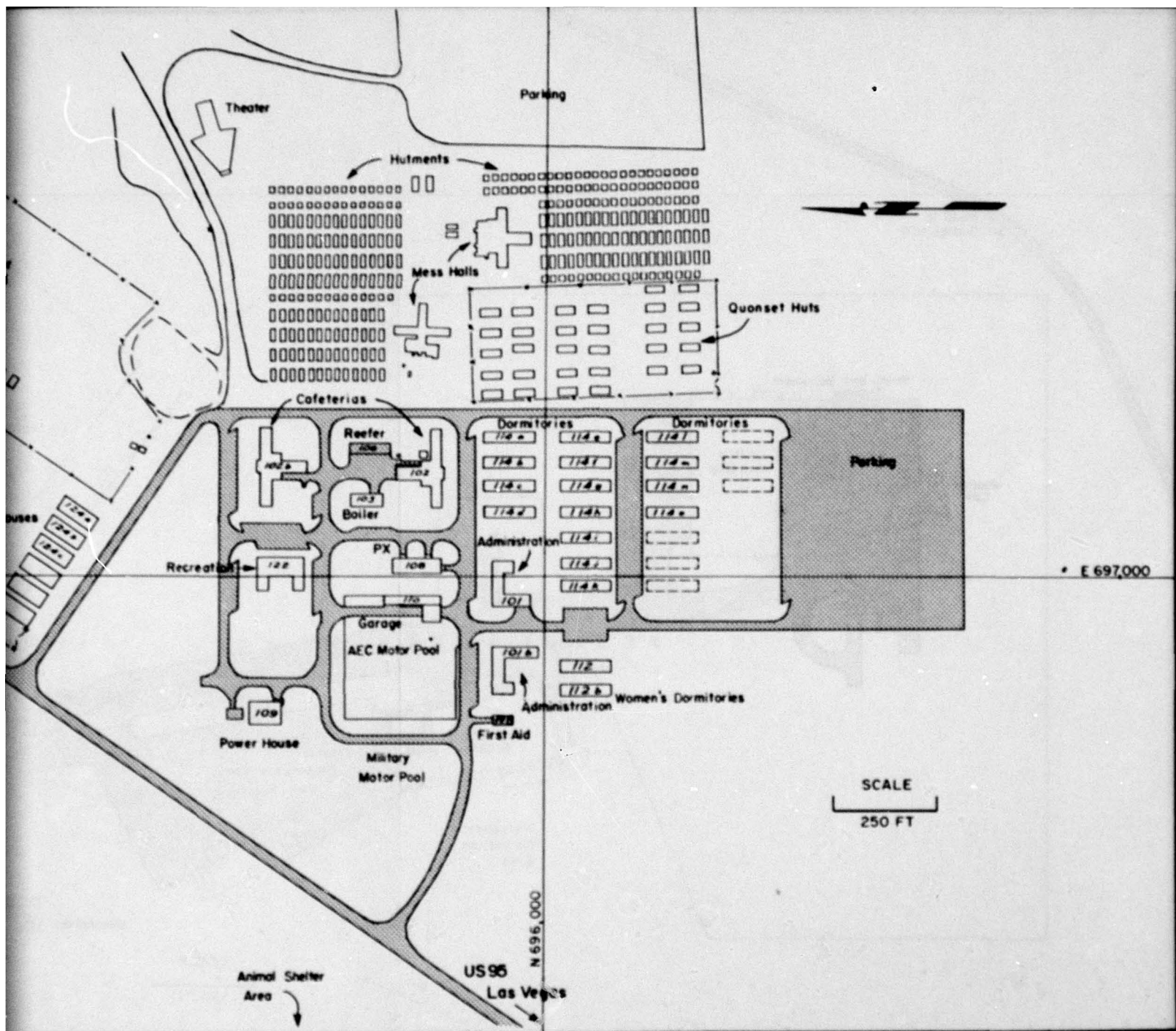


Fig. 5—Camp Mercury.

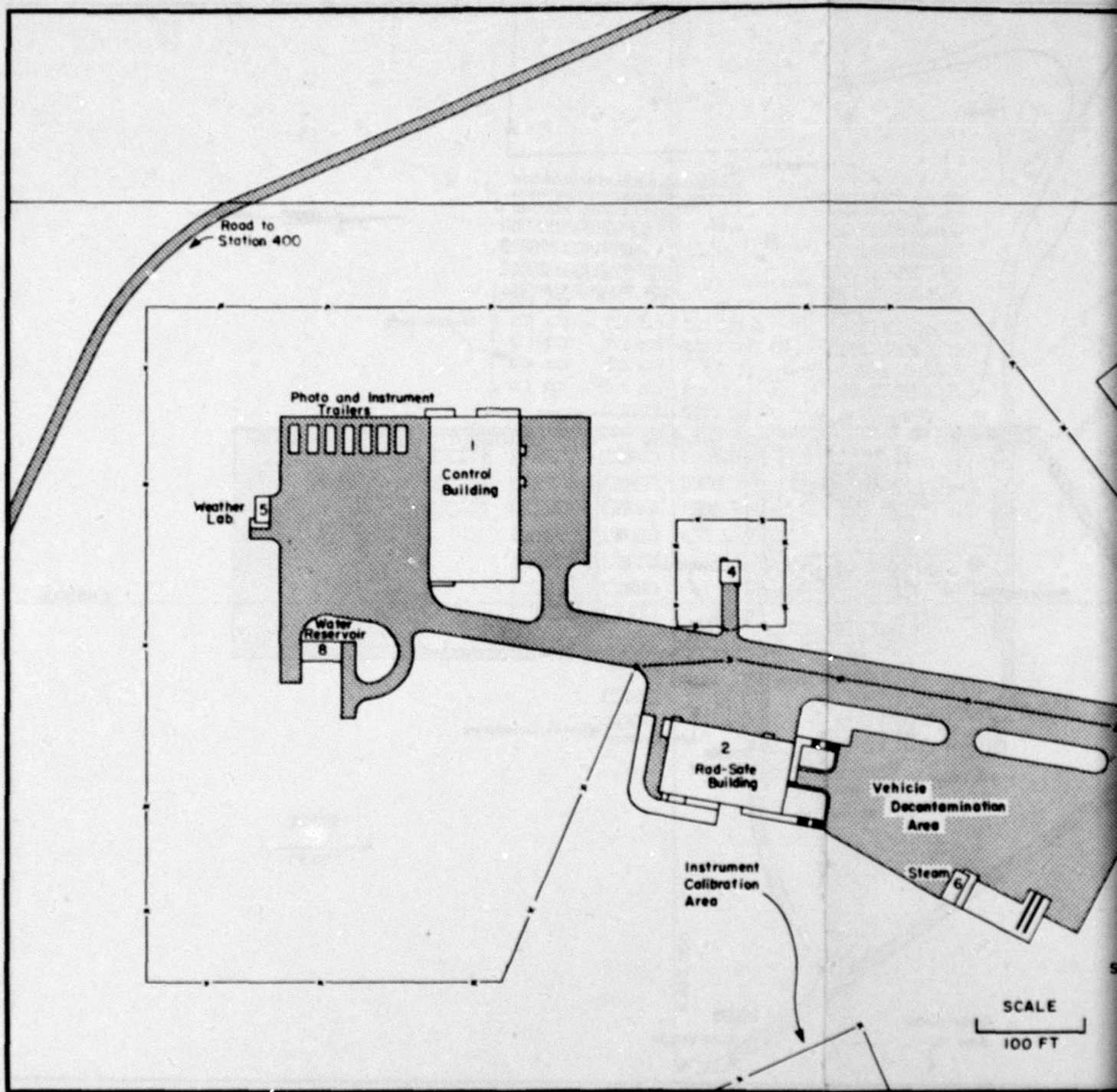


Fig. 6—Control Point area.

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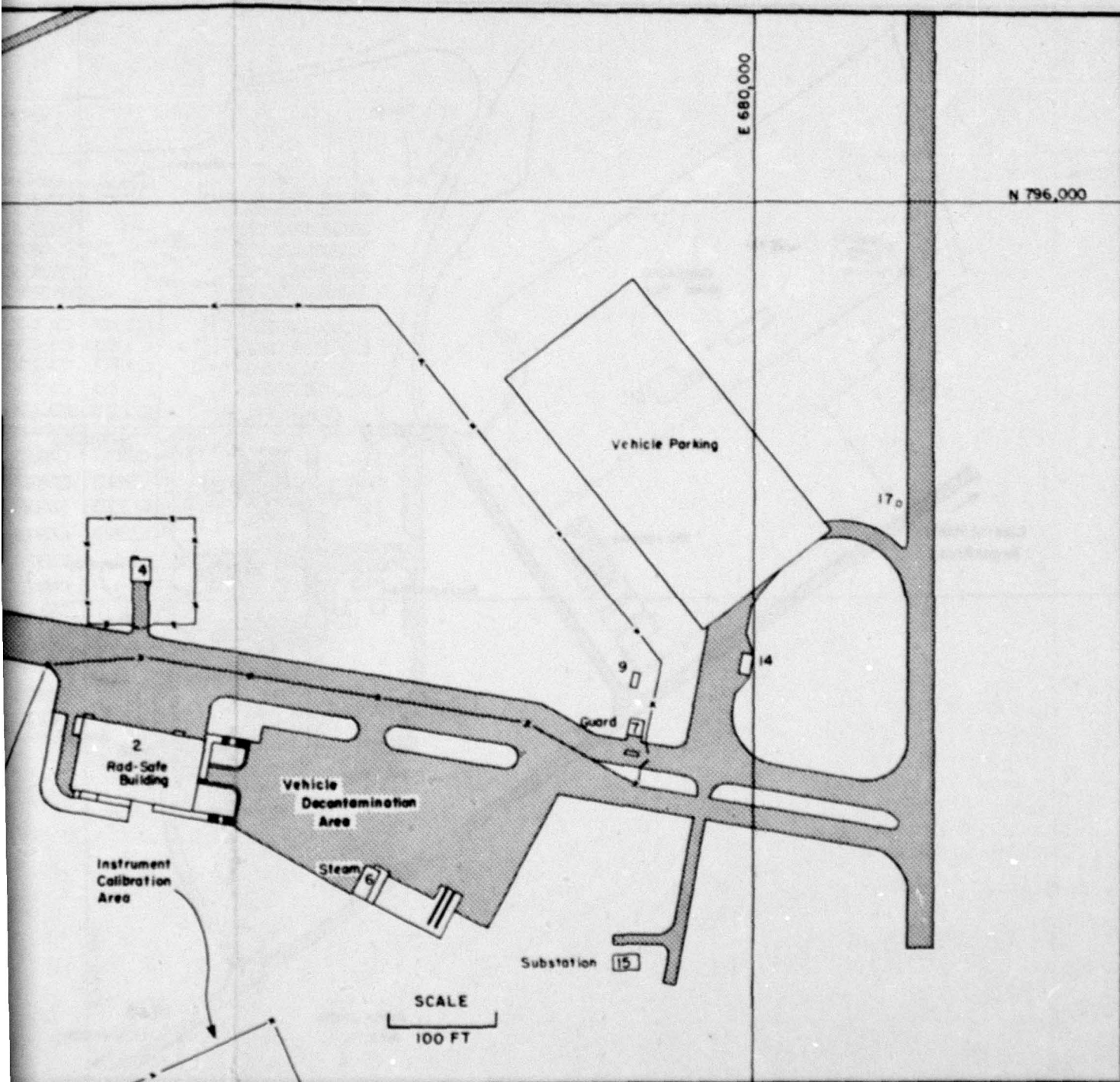


Fig. 6—Control Point area.

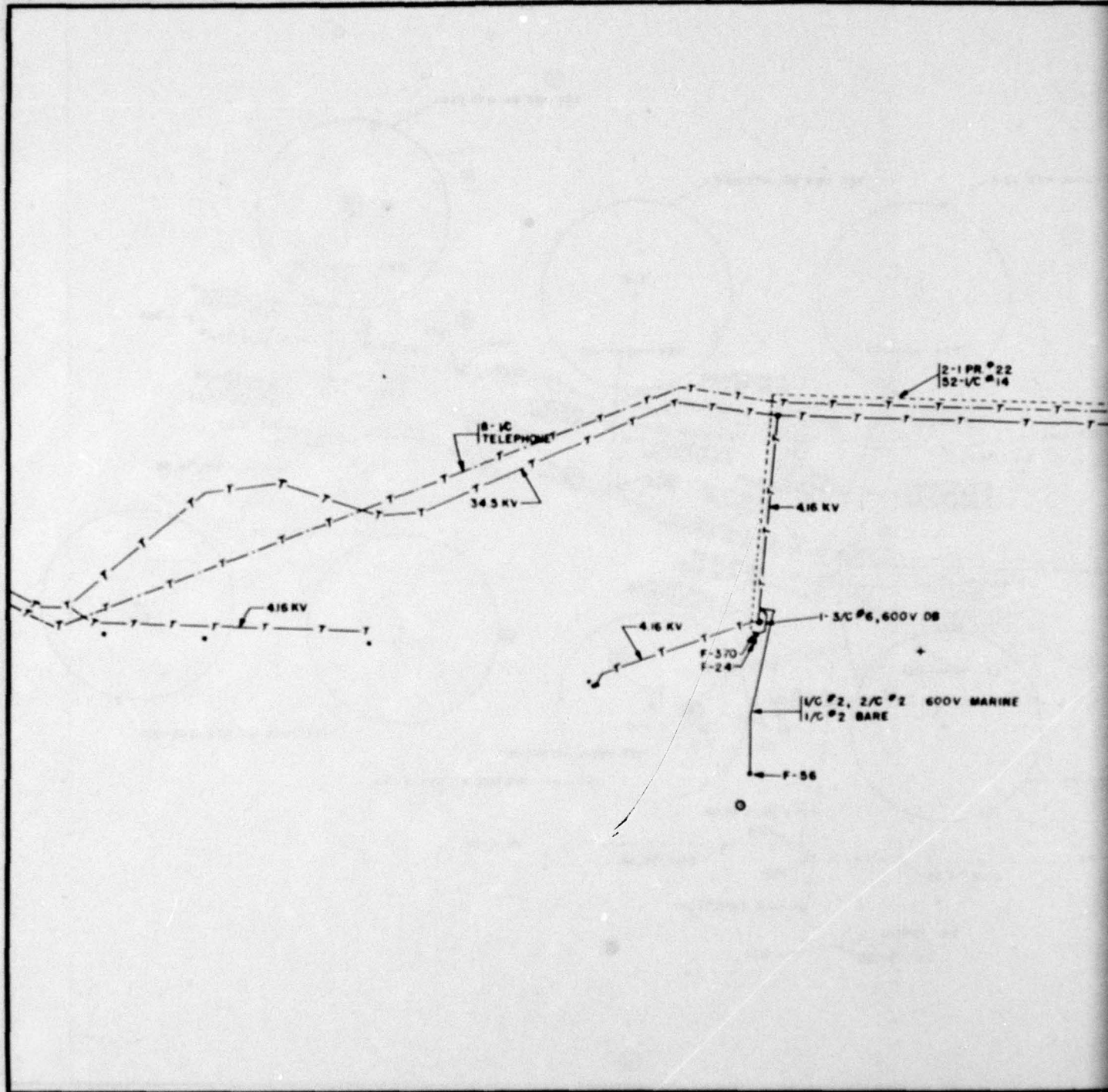


Fig. 7—Frenchman Flat area: power, telephone, and timing.

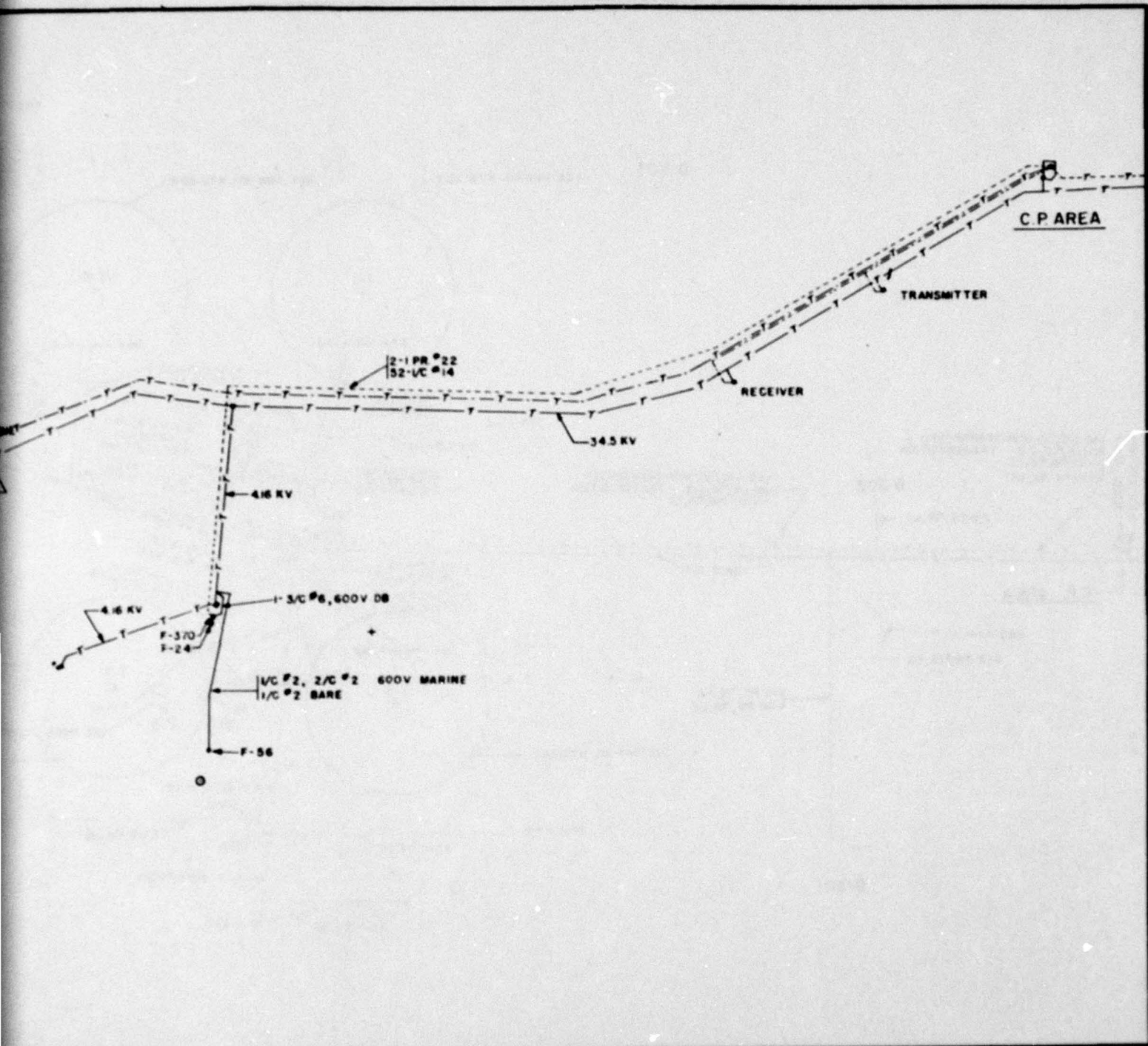


Fig. 7—Frenchman Flat area: power, telephone, and timing.

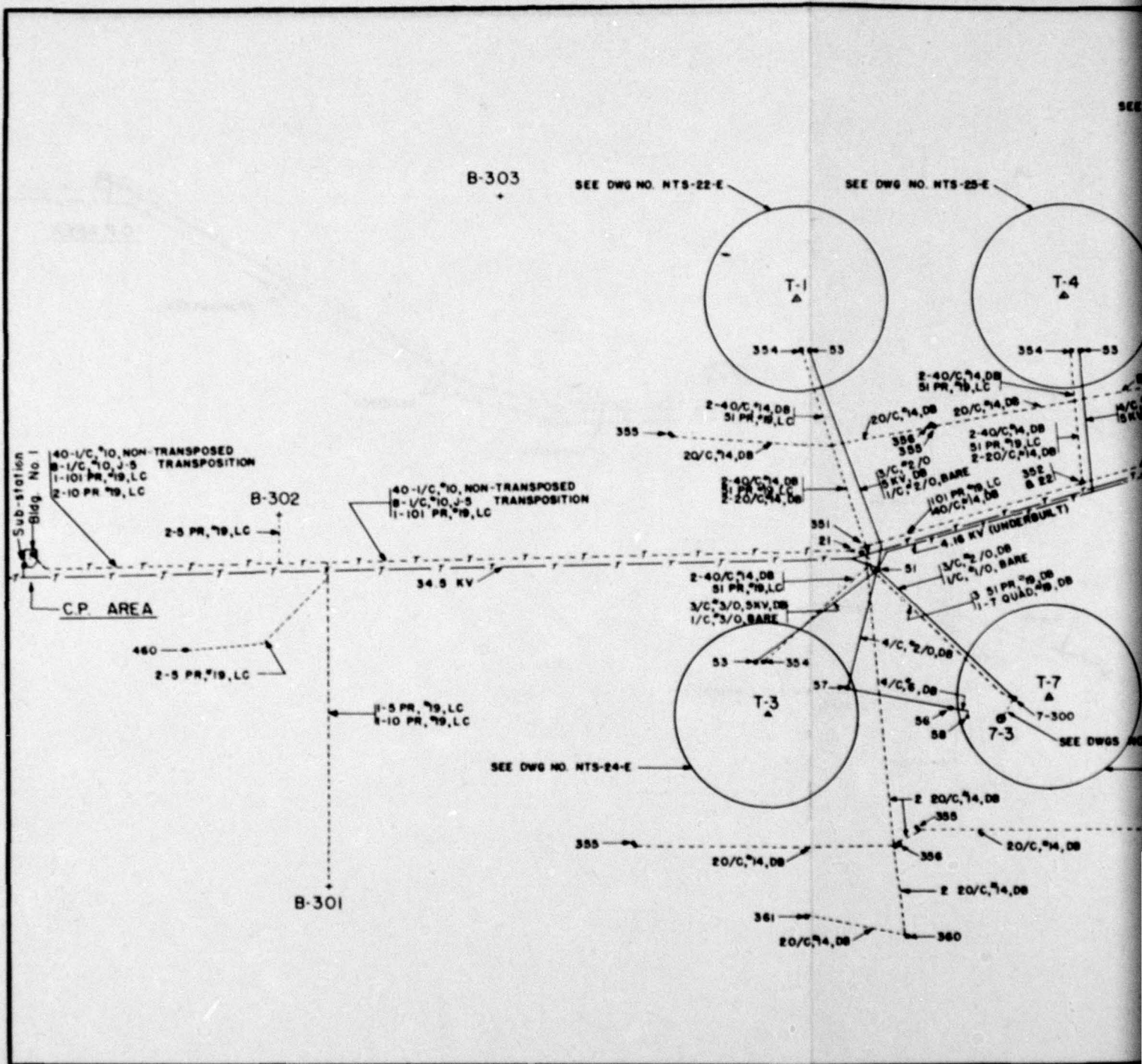
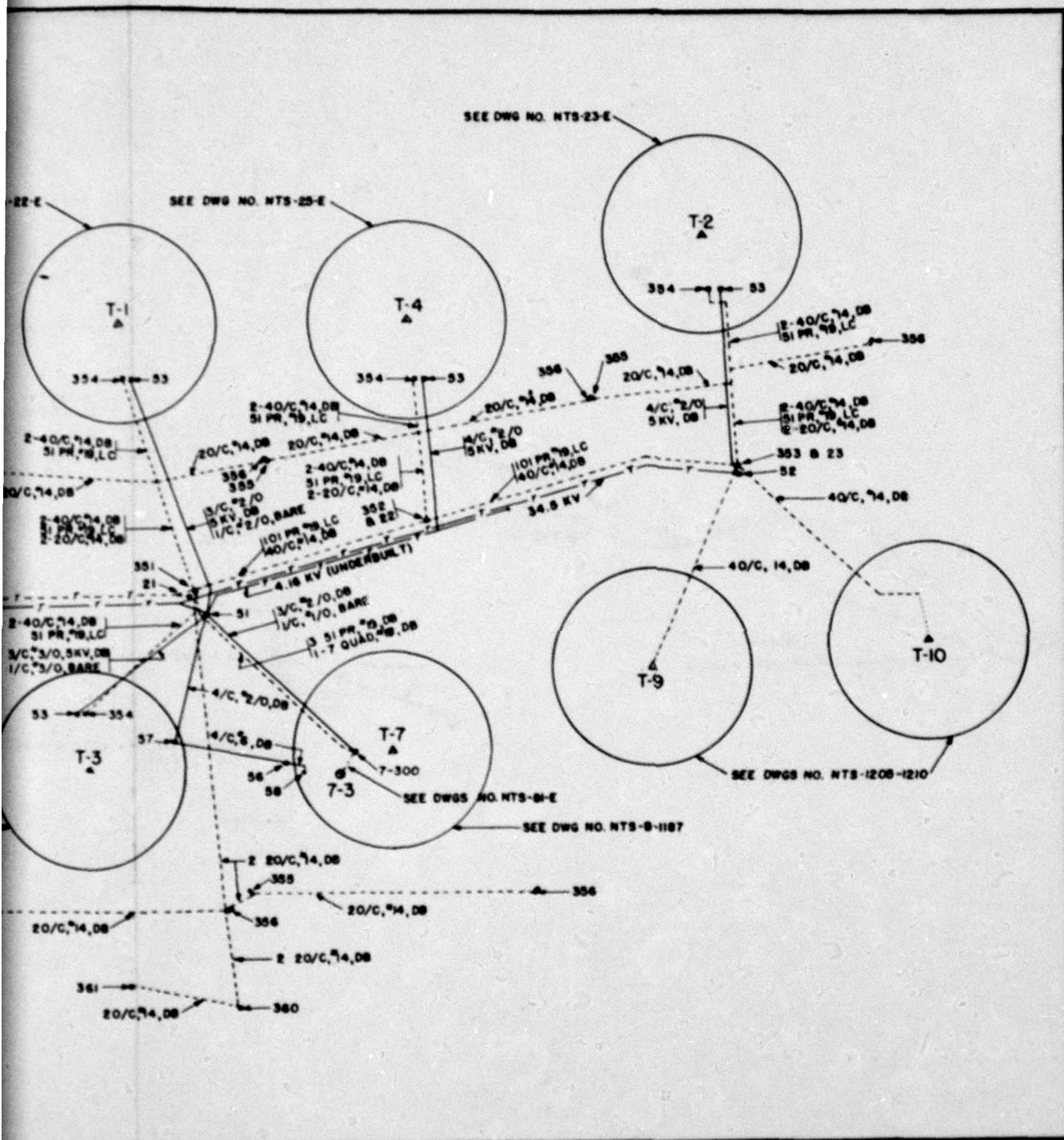


Fig. 8—Yucca Flat area: power, telephone, and timing.

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Yucca Flat area: power, telephone, and timing.

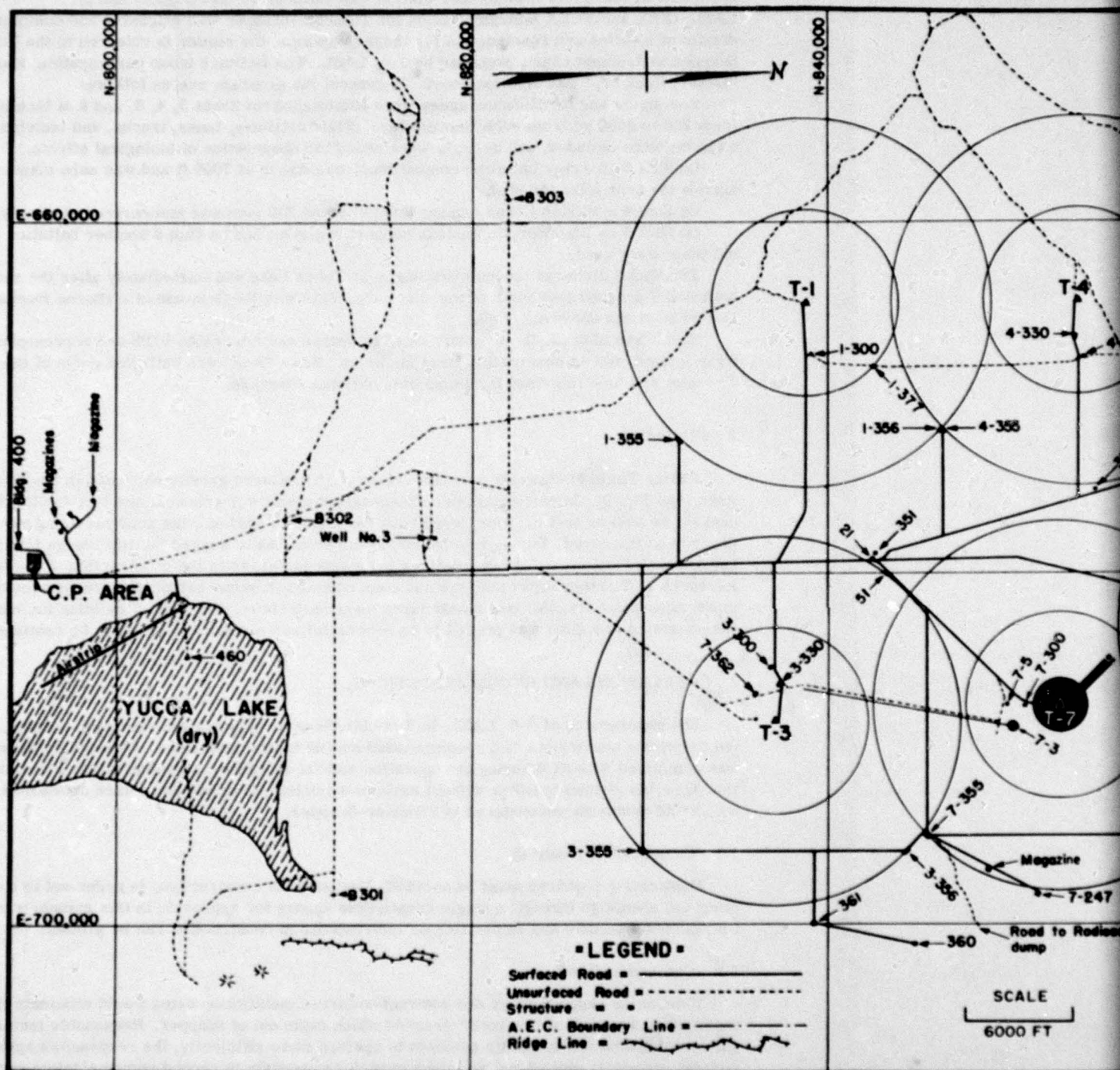
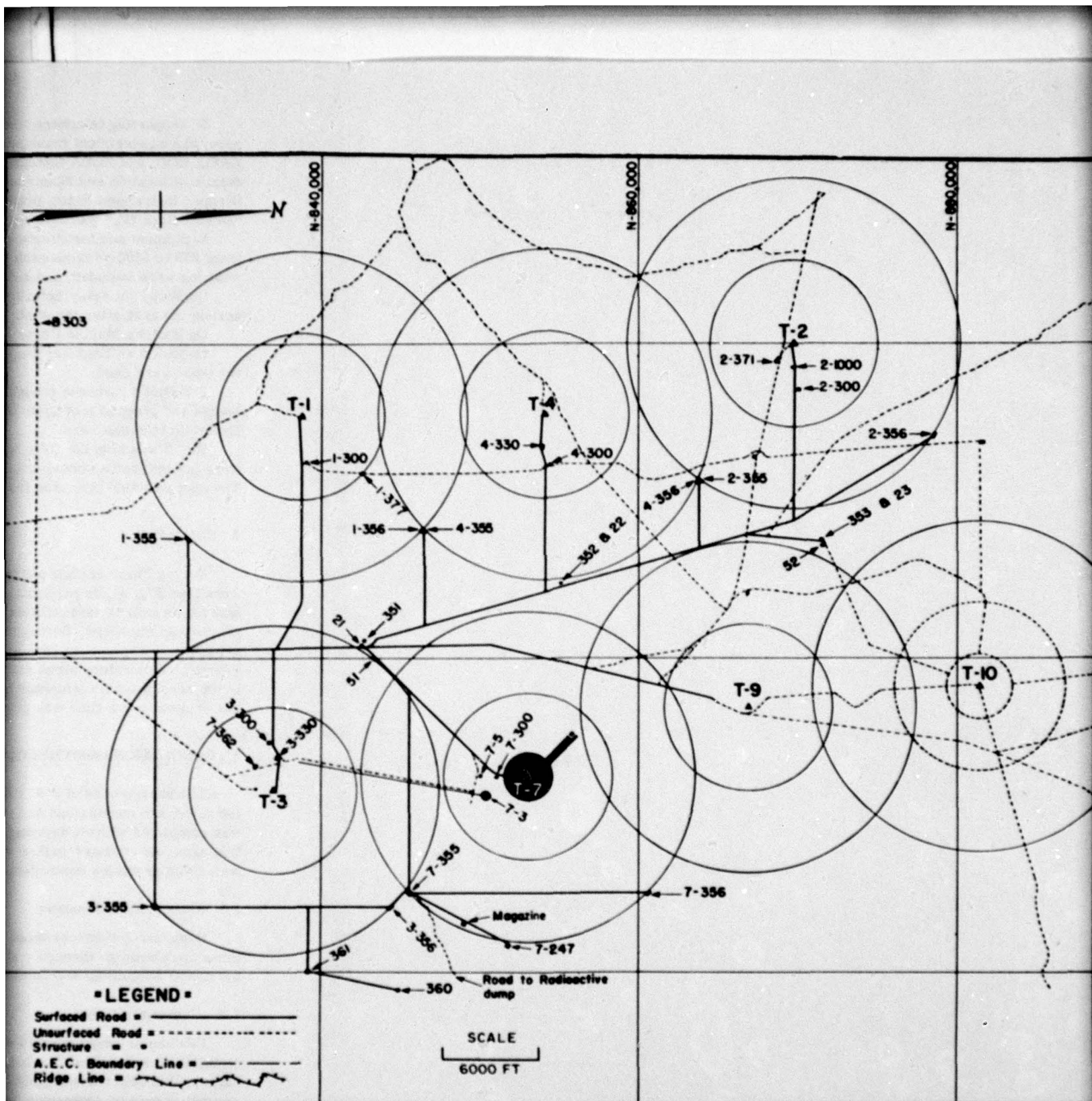


Fig. 9—Yucca Flat area.



5. Supporting telephone lines and signal cable (permanent) were run to stations west of zero, and an electrical transformer station was established (see Figs. 7 and 8). LASL, DOD, and FCDA instrumentation for Tumbler-Snapper was extensive and complex. For details of location and construction for these programs, the reader is referred to the Tumbler-Snapper instrument chart, prepared by J-6, LASL. The military troop participation, known as "Desert Rock IV," was also extensive. In general the program was as follows:

Equipment and fortification areas were established for Shots 3, 4, 6, and 8 at locations from 250 to 3500 yd from each Ground Zero. Field artillery, tanks, trucks, and individual weapons were included, and animals were added for observation of biological effects.

On Shot 3 an Army battalion combat team was dug in at 7000 ft and was zero maneuvered across the area after the shot.

On Shot 4 a Marine Corps combat team of about 200 men was maneuvered similarly.

On Shot 6 an Engineer amphibious support regiment and on Shot 8 another battalion combat team were used.

For Shot 3 airborne troops were dug in at Yucca Lake and immediately after the shot were loaded and dropped just north of the shot zero. This was the first use of airborne troops in Desert Rock maneuvers.

Shot 3 was also the first "open" shot. Newsmen and interested VIPS and representatives were invited, and an observation point known as "News Knob" was built just north of the CP. The shot was also televised for immediate national coverage.

2 SUMMARY

During Tumbler-Snapper permanent test facilities were greatly expanded in the Yucca Flat Area (see Fig. 9). In particular, permanent target areas were chosen, and test-facility blockhouses, as well as test utilities, were built for them. In addition, the road net was greatly expanded and improved. During this operation the problems of rugged facility design for the target areas first came up. Some solutions were successful, as in the construction of the Naval Research Laboratory alpha stations and coax complexes; some solutions were unsuccessful, as in the zero-point transformer blockhouses mentioned above. The idea of building for more than one operation at a time was proved to be successful and economical and is to be continued.

3 CONCLUSIONS AND RECOMMENDATIONS

The experiences of J-6, LASL, in Tumbler-Snapper planning and operation support, have led to certain conclusions and recommendations for future operations. Although construction was completed without delaying the operation and the scientific, administrative, and construction agencies worked together without excessive friction, it is felt that future operations may well avoid problems encountered in Tumbler-Snapper.

3.1 Construction Planning

Duplicate J-6 offices must be avoided. Requests for construction, in order not to tie each other up, should go through a single responsible agency for approval. In this manner rivalry for construction help and duplication or interference in construction can be avoided.

3.2 Communications

Contractor responsibility and contract-enforced installation dates would eliminate the late installation and lack of "as-built" records which came out of Snapper. Reasonable installation dates will enable the scientific projects to operate more efficiently, the responsible agencies to correct errors or omissions, and the contractors properly to record communication equipment and line locations as-built.

3.3 Work Support

Careful planning beforehand will permit a better estimate of the operational work load. During Tumbler-Snapper the support labor force was definitely inadequate for the operational work. It is suggested that planning groups should discuss, point by point, with as many individual projects as possible, their support requirements in order to arrive at reasonable estimates of work loads. Expense and overwork may thus be cut down.

DISTRIBUTION

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ARMY ACTIVITIES

| | |
|---|-------|
| Asst. Chief of Staff, G-3, D/A, Washington 25, D. C., ATTN: Dep. CofS, G-3 (RR&SW) | 1 |
| Asst. Chief of Staff, G-4, D/A, Washington 25, D. C. | 2 |
| Chief of Ordnance, D/A, Washington 25, D. C., ATTN: ORDTX-AR | 3 |
| Chief Signal Officer, D/A, P&O Division, Washington 25, D. C., ATTN: SIGOP | 4-6 |
| The Surgeon General, D/A, Washington 25, D. C., ATTN: Chairman, Medical R&D Board | 7 |
| Chief Chemical Officer, D/A, Washington 25, D. C. | 8-9 |
| The Quartermaster General, CBR, Liaison Officer, Research and Development Div., D/A, Washington 25, D. C. | 10-11 |
| Chief of Engineers, D/A, Washington 25, D. C., ATTN: ENGNB | 12-16 |
| Chief of Transportation, Military Planning and Intelligence Div., Washington 25, D. C. | 17 |
| Chief, Army Field Forces, Ft. Monroe, Va. | 18-19 |
| President, Board #1, OCAFF, Ft. Bragg, N. C. | 20 |
| President, Board #4, OCAFF, Ft. Bliss, Tex. | 21 |
| Commanding General, First Army, Governor's Island, New York 4, N. Y. | 22 |
| Commanding General, Second Army, Ft. George G. Meade, Md. | 23 |
| Commanding General, Third Army, Ft. McPherson, Ga., ATTN: ACofS, G-3 | 24 |
| Commanding General, Fourth Army, Ft. Sam Houston, Tex., ATTN: G-3 Section | 25 |
| Commanding General, Fifth Army, 1660 E. Hyde Park Blvd., Chicago 15, Ill. | 26 |
| Commanding General, Sixth Army, Presidio of San Francisco, Calif., ATTN: AMGCT-4 | 27 |
| Commanding General, U. S. Army Caribbean, Ft. Amador, C. Z., ATTN: Cml. Off. | 28 |
| Commanding General, USARFANT & MDPR, Ft. Brooke, Puerto Rico | 29 |
| Commanding General, U. S. Forces Austria, APO 168, c/o PM, New York, N. Y., ATTN: ACofS, G-3 | 30 |
| Commander-in-Chief, Far East Command, APO 500, c/o PM, San Francisco, Calif., ATTN: ACofS, J-3 | 31-32 |
| Commanding General, U. S. Army Forces Far East (Main), APO 343, c/o PM, San Francisco, Calif., ATTN: ACofS, G-3 | 33 |
| Commanding General, U. S. Army Alaska, APO 942, c/o PM, Seattle, Wash. | 34 |
| Commanding General, U. S. Army Europe, APO 403, c/o PM, New York, N. Y., ATTN: OPOT Div., Combat Dev. Br. | 35-36 |
| Commandant, Command and General Staff College, Ft. Leavenworth, Kan., ATTN: ALLLS(AS) | 37-38 |
| Commandant, The Artillery School, Ft. Sill, Okla. | 39 |
| Commandant, The AA&GM Branch, The Artillery School, Ft. Bliss, Tex. | 40 |
| Commanding General, Medical Field Service School, Brooke Army Medical Center, Ft. Sam Houston, Tex. | 41 |
| Director, Special Weapons Development Office, Ft. Bliss, Tex., ATTN: Lt. Arthur Jaskierny | 42 |
| Superintendent, U. S. Military Academy, West Point, N. Y., ATTN: Prof. of Ordnance | 43 |
| Commandant, Chemical Corps School, Chemical Corps Training Command, Ft. McClellan, Ala. | 44 |

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| Commanding General, Research and Engineering Command, Army Chemical Center, Md., ATTN: Deputy for RW and Non-Toxic Material | 45-46 |
| Commanding General, Aberdeen Proving Ground, Md. (inner envelope), ATTN: RD Control Officer (for Director, Ballistic Research Laboratories) | 47 |
| Commanding General, The Engineer Center, Ft. Belvoir, Va., ATTN: Asst. Commandant, Engineer School | 48-50 |
| Commanding Officer, Engineer Research and Development Laboratory, Ft. Belvoir, Va., ATTN: Chief, Technical Intelligence Branch | 51 |
| Commanding Officer, Picatinny Arsenal, Dover, N. J., ATTN: ORDBB-TK | 52 |
| Commanding Officer, Frankford Arsenal, Philadelphia 37, Pa., ATTN: Mr. C. C. Fawcett | 53 |
| Commanding Officer, Chemical Corps Chemical and Radiological Laboratory, Army Chemical Center, Md., ATTN: Tech. Library | 54-55 |
| Commanding Officer, Transportation R&D Station, Ft. Eustis, Va. | 56 |
| Commanding General, The Transportation Center and Ft. Eustis, Ft. Eustis, Va., ATTN: Military Science & Tactics Board | 57 |
| Director, Operations Research Office, Johns Hopkins University, 6410 Connecticut Ave., Chevy Chase, Md., ATTN: Library | 58 |
| NAVY ACTIVITIES | |
| Chief of Naval Operations, D/N, Washington 25, D. C., ATTN: OP-36 | 59-60 |
| Chief of Naval Operations, D/N, Washington 25, D. C., ATTN: OP-374(OEG) | 61 |
| Chief of Naval Operations, D/N, Washington 25, D. C., ATTN: OP-322V | 62 |
| Chief, Bureau of Medicine and Surgery, D/N, Washington 25, D. C., ATTN: Special Weapons Defense Div. | 63 |
| Chief, Bureau of Ordnance, D/N, Washington 25, D. C. | 64 |
| Chief of Naval Personnel, D/N, Washington 25, D. C. | 65 |
| Chief, Bureau of Ships, D/N, Washington 25, D. C., ATTN: Code 348 | 66 |
| Chief, Bureau of Supplies and Accounts, D/N, Washington 25, D. C. | 67 |
| Chief, Bureau of Aeronautics, D/N, Washington 25, D. C. | 68-69 |
| Chief of Naval Research, Department of the Navy, Washington 25, D. C., ATTN: LT(jg) F. McKee, USN | 70 |
| Commander-in-Chief, U. S. Pacific Fleet, Fleet Post Office, San Francisco, Calif. | 71 |
| Commander-in-Chief, U. S. Atlantic Fleet, U. S. Naval Base, Norfolk 11, Va. | 72 |
| Commandant, U. S. Marine Corps, Washington 25, D. C., ATTN: Code AO3H | 73 |
| Superintendent, U. S. Naval Postgraduate School, Monterey, Calif. | 74 |
| Commanding Officer, U. S. Naval Schools Command, U. S. Naval Station, Treasure Island, San Francisco, Calif. | 75 |
| Commanding Officer, U. S. Fleet Training Center, Naval Base, Norfolk 11, Va., ATTN: Special Weapons School | 76 |
| Commanding Officer, U. S. Fleet Training Center, Naval Station, San Diego 36, Calif., ATTN: (SPWP School) | 77 |
| Commanding Officer, U. S. Naval Damage Control Training Center, Naval Base, Philadelphia 12, Pa., ATTN: ABC Defense Course | 78 |
| Commanding Officer, U. S. Naval Unit, Chemical Corps School, Army Chemical Training Center, Ft. McClellan, Ala. | 79 |
| Joint Landing Force Board, Marine Barracks, Camp Lejeune, N. C. | 80 |
| Commander, U. S. Naval Ordnance Laboratory, Silver Spring 19, Md., ATTN: R | 81 |
| Commander, U. S. Naval Ordnance Test Station, Inyokern, China Lake, Calif. | 82 |
| Officer-in-Charge, U. S. Naval Civil Engineering Res. and Evaluation Lab., U. S. Naval Construction Battalion Center, Port Hueneme, Calif., ATTN: Code 753 | 83 |
| Commanding Officer, U. S. Naval Medical Research Inst., National Naval Medical Center, Bethesda 14, Md. | 84 |
| Director, U. S. Naval Research Laboratory, Washington 25, D. C. | 85 |
| Director, The Material Laboratory, New York Naval Shipyard, Brooklyn, N. Y. | 86 |
| Commanding Officer and Director, U. S. Navy Electronics Laboratory, San Diego 52, Calif., ATTN: Code 4223 | 87 |
| Commanding Officer, U. S. Naval Radiological Defense Laboratory, San Francisco 24, Calif., ATTN: Technical Information Division | 88-89 |

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| Officer-in-Charge, Special Weapons Supply Depot, U. S. Naval Supply Center, Norfolk 11, Va. | 90 |
| Commanding Officer and Director, David W. Taylor Model Basin, Washington 7, D. C., ATTN: Library | 91 |
| Commander, U. S. Naval Air Development Center, Johnsville, Pa. | 92 |
| Director, Office of Naval Research Branch Office, 1000 Geary St., San Francisco, Calif. | 93-94 |

AIR FORCE ACTIVITIES

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|---|---------|
| Astt. for Atomic Energy, Headquarters, USAF, Washington 25, D. C., ATTN: DCS/O | 95 |
| Director of Operations, Headquarters, USAF, Washington 25, D. C., ATTN: Operations Analysis | 96 |
| Director of Plans, Headquarters, USAF, Washington 25, D. C., ATTN: War Plans Div. | 97 |
| Director of Research and Development, Headquarters, USAF, Washington 25, D. C., ATTN: Combat Components Div. | 98 |
| Director of Intelligence, Headquarters, USAF, Washington 25, D. C., ATTN: AFOIN-1B2 | 99-100 |
| The Surgeon General, Headquarters, USAF, Washington 25, D. C., ATTN: Bio. Def. Br., Pre. Med. Div. | 101 |
| Astt. Chief of Staff, Intelligence, Headquarters, U. S. Air Forces Europe, APO 633, c/o PM, New York, N. Y., ATTN: Air Intelligence Branch | 102 |
| Commander, 497th Reconnaissance Technical Squadron (Augmented), APO 633, c/o PM, New York, N. Y. | 103 |
| Commander, Far East Air Forces, APO 925, c/o PM, San Francisco, Calif. | 104 |
| Commander, Strategic Air Command, Offutt Air Force Base, Omaha, Nebr., ATTN: Special Weapons Branch, Inspection Div., Inspector General | 105 |
| Commander, Tactical Air Command, Langley AFB, Va., ATTN: Documents Security Branch | 106 |
| Commander, Air Defense Command, Ent AFB, Colo. | 107 |
| Commander, Air Training Command, Scott AFB, Belleville, Ill., ATTN: DCS/O GTP | 108 |
| Commander, Air Research and Development Command, PO Box 1395, Baltimore, Md., ATTN: RDDN | 109 |
| Commander, Air Proving Ground Command, Eglin AFB, Fla., ATTN: AG/TRB | 110 |
| Commander, Air University, Maxwell AFB, Ala. | 111-112 |
| Commander, Flying Training Air Force, Waco, Tex., ATTN: Director of Observer Training | 113-120 |
| Commander, Crew Training Air Force, Randolph Field, Tex., ATTN: 2GTS, DCS/O | 121 |
| Commander, Headquarters, Technical Training Air Force, Gulfport, Miss., ATTN: TA&D | 122 |
| Commandant, Air Force School of Aviation Medicine, Randolph AFB, Tex. | 123-124 |
| Commander, Wright Air Development Center, Wright-Patterson AFB, Dayton, O., ATTN: WCOESP | 125 |
| Commander, Air Force Cambridge Research Center, 230 Albany Street, Cambridge 39, Mass., ATTN: CRW, Atomic Warfare Directorate | 126 |
| Commander, Air Force Cambridge Research Center, 230 Albany Street, Cambridge 39, Mass., ATTN: CRQST-2 | 127 |
| Commander, Air Force Special Weapons Center, Kirtland AFB, N. Mex., ATTN: Library | 128-130 |
| Commandant, USAF Institute of Technology, Wright-Patterson AFB, Dayton, O., ATTN: Resident College | 131 |
| Commander, Lowry AFB, Denver, Colo., ATTN: Department of Armament Training | 132 |
| Commander, 1009th Special Weapons Squadron, Headquarters, USAF, Washington 25, D. C. | 133 |
| The RAND Corporation, 1700 Main Street, Santa Monica, Calif., ATTN: Nuclear Energy Division | 134-135 |

OTHER DEPARTMENT OF DEFENSE ACTIVITIES

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| Astt. Secretary of Defense, Research and Development, D/D, Washington 25, D. C. | 136 |
| U. S. National Military Representative, Headquarters, SHAPE, APO 55, c/o PM, New York, N. Y., ATTN: Col. J. P. Healy | 137 |
| Director, Weapons Systems Evaluation Group, OSD, Rm 2E1006, Pentagon, Washington 25, D. C. | 138 |
| Commandant, Armed Forces Staff College, Norfolk 11, Va., ATTN: Secretary | 139 |

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Commanding General, Field Command, Armed Forces Special Weapons Project, PO Box
5100, Albuquerque, N. Mex.
Chief, Armed Forces Special Weapons Project, PO Box 2610, Washington 13, D. C.

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ATOMIC ENERGY COMMISSION ACTIVITIES

U. S. Atomic Energy Commission, Classified Technical Library, 1901 Constitution Ave.,
Washington 25, D. C., ATTN: Mrs. J. M. O'Leary (for DMA)
Los Alamos Scientific Laboratory, Report Library, PO Box 1663, Los Alamos, N. Mex.,
ATTN: Helen Redman
Sandia Corporation, Classified Document Division, Sandia Base, Albuquerque, N. Mex.,
ATTN: Martin Lucero
University of California Radiation Laboratory, PO Box 808, Livermore, Calif., ATTN:
Margaret Folden
Weapon Data Section, Technical Information Service, Oak Ridge, Tenn.
Technical Information Service, Oak Ridge, Tenn. (surplus)

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